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Vol. 86

JANUARY 1942

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EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

VOL. 86

JANUARY 1942

No. 1

THE FIFTY-FIFTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

In accordance with its general policy of alternating its meetings between Washington and Chicago, the fifty-fifth annual convention of the Association of Land-Grant Colleges and Universities was duly scheduled to meet in the National Capital. Following a request from the Administrator of the Federal Office of Price Administration and Civilian Supply that conventions be detoured from Washington during the national emergency, the executive committee on September 9 transferred the sessions to Chicago. This action was in a way analogous to the holding of the thirty-second convention in Baltimore in January 1919.

In consequence of the transfer the convention took on the general aspects and characteristics of a Chicago meeting. Its central location was advantageous to many institutions, and the aggregate attendance was about as usual, although for various reasons the delegation from the Federal Department of Agriculture was less inclusive than for many years.

The convention was held from November 10 to 12, 1941, with pre-convention sessions of the section on engineering and the subsections of experiment stations and extension work on November 8 and 9 and committee meetings which began as early as November 5. The general program arrangement was that of recent years, with an increasing tendency to conserve time by the utilization of luncheon and dinner periods for group discussions.

The underlying theme of the convention was well expressed by the title selected by Dean Emeritus F. B. Mumford of Missouri for his opening address as president of the association. This was The Land-Grant College and the National Welfare. Dean Mumford reviewed the progress of the land-grant institutions as pioneers in a type of education based on human needs, stating that they have become recognized for "their leadership in rural affairs, their insistence upon democracy in education, and their firm reliance on scientific research." Their major objective he found to be the social well-being of rural people, as promoted by teaching college students, by research, and by extension. As regards research, he characterized as an accomplishment of major importance not only to agriculture but to science in general the conversion of farm people, ever "the

most conservative and careful group in the acceptance of new knowledge or new methods, . . . to a full appreciation of the value of scientific research and an enthusiastic acceptance of the results of science," and he assigned as the immediate specific task of the experiment station today the determination of "how its vast store of knowledge gained by painstaking research can be so utilized as to insure social progress and to prevent, cure, or ameliorate social disorders."

This address was effectively supplemented as to its social implications by President Edmund E. Day of Cornell University. His paper, entitled Science, Society, and Social Progress, considered "the continuing impact of science on man's estate," and pointed out that "those who are responsible for social policy, of which educational policy is an important part, need to keep under constant surveillance the wide-ranging changes—economic, political, social, moral—which science is all the time working upon our social order. . . . American institutions of higher learning must come to see their responsibilities in larger terms than have prevailed in recent generations. These responsibilities relate to the preservation of moral and spiritual values, the sound evolution of an improved economic system, the development of a more adequate free state, in fact to the whole reach of social policy, for enduring social progress. What we educators need to do right now is to devise concrete educational programs through which these larger responsibilities can be more fully discharged. In this undertaking no time is to be lost. Science presses on even if society and the educators lag."

The relation of the land-grant colleges to defense was naturally given much consideration. A message from Secretary of Agriculture Claude R. Wickard, who was unable to be present, pointed out that "without question the entire population is going to have to take a more realistic attitude toward this war. The future may bring hardships and sacrifices to us all. Farmers' difficulties are already beginning to show up in the form of scarcity of skilled labor, farm machinery, fertilizer, and spray materials. The experiment stations and the extension service are going to have to give the farmer counsel as to the best ways to meet such problems and others unforeseen at this time. I can see an increased demand for technical assistance and for trained leaders for rural people and people living in villages and towns. The land-grant colleges are going to be hard pressed to meet this demand."

This admonition of the Secretary was amplified by others from the Department, notably Dr. M. L. Wilson, Director of Extension, who stated that "in all the years the association has been meeting, it has never convened in a more critical period or with greater objectivity." Commending what had already been accomplished, he

maintained that "if it had not been for the land-grant colleges, their training of farmers, of agricultural scientists, economists, engineers, nutritionists, and administrators, and for the extension work which has carried the findings of science to all farmers, it would not be possible to reach the farm production goals which have been established for next year. We would not have the knowledge upon which to base our farming operations; we would not have the modern equipment; we would not have the improved plant varieties and high-producing animals necessary to make such efficient production possible. The land-grant colleges and their cumulative contributions may well prove to be the salvation of democracy."

Looking toward the future, Director Wilson declared that in the formulation of programs Priority No. 1 must be accorded to defense and Priority No. 2 to post-war planning. Under the first of these, he regarded as essential the "provision of the technical information on how to make each hour of man labor and each pound of feed or seed or fertilizer count for the most in production" and the carrying "to each farm the facts about the need of our Nation for unstinted production of some commodities and controlled production of others and the facts about the arrangements which have been made by the Federal Government to safeguard farmers if they expand production." As to the post-war era, he deprecated an unduly fatalistic point of view, since "our national leadership proceeds from the premise that the people of the United States still make their own destiny." He pointed out that a standing committee has already been appointed by the Department to prepare plans for readjustments in agriculture and rural activities when peace comes and advocated similar preparedness on the part of State and county committees. These committees, he made clear, "need to plan not only for better farming but also for better living for a third of the Nation's people. They need the philosophical approach, as well as the scientific approach, to the subject with which they will deal."

Many addresses were directly associated with specific phases of defense. Among these were those of Gen. Louis V. Hershey of the War Department on Selective Service; Dr. Lydia Roberts of the University of Chicago on Nutrition and Defense; Director Wilson on The Extension Service and the Defense Program; Nutrition and Health as a Part of National Defense, by Dr. C. A. Elvehjem of Wisconsin; and three papers by Deans H. J. Reed of Indiana and J. F. Cunningham of Ohio and Prof. S. B. Shirkey of Missouri on adjustments related to agricultural teaching. In addition, entire sessions were set aside in the section on engineering and the experiment station subsection. Of these the former was addressed by Col. Frank J. McSherry of the Federal Security Agency, Rear Admiral

John Downes, and Commissioner A. S. Flemming of the United States Civil Service Commission. The experiment station discussion dealt with research during the national emergency. It was opened by Director R. B. Corbett of Maryland, who considered the evaluation of existing projects for defense needs, and Dr. R. W. Trullinger, Assistant Chief of the Office of Experiment Stations, presented a statement prepared by the staff of that Office on the Establishment of New Projects Under the National Emergency.

Unusual interest was manifested by the convention in the defense aspects of food and nutrition. Secretary Wickard, Director Wilson, and Federal Security Administrator Paul V. McNutt were among the speakers along general lines who emphasized the fundamental importance of an adequate knowledge of food values, nutrition, and health. More specific contributions were those of Dr. C. A. Elvehjem of Wisconsin, pleading for both increased knowledge and a wider application of what is already known; the paper of Dr. Lydia Roberts on Nutrition and Defense, already referred to; the luncheon session of the section on home economics research, in which Miss Sybil L. Smith of the Office of Experiment Stations discussed the research recommendations of the committee on food and nutrition of the National Research Council and Dr. Louise Stanley the Research in the Bureau of Home Economics in Relation to National Defense; and a subsequent session of the section led by Miss Leila Ogle of the Federal Security Agency on Preparing Home Economists To Work With Low-Income Farm Families.

A broadened interest in agriculture and education in foreign lands was also much in evidence. The subsection on resident teaching devoted a session to inter-American cooperation in agricultural education, Mexican agricultural problems, and production and marketing trends in South American countries. A paper by Dr. J. Fred Rippey of the University of Chicago was given before the joint session of the subsections of the section of agriculture entitled Economic and Social Relationships With Our Latin-American Neighbors. The dinner meeting of the section of graduate work was addressed by Dean Harold Benjamin of Maryland on South American Education—New and Old, and the dinner meeting of the experiment station subsection by Mr. J. Clyde Marquis of the U. S. D. A. Office of Foreign Agricultural Relations on Changes in World Agriculture.

Still another group of papers dealt with the problems confronting democracy and civilization. Among these may be mentioned *The Problem of Survival*, by President C. A. Dykstra of Wisconsin; *Can America Develop an Antidote for the Doctrines of Hitlerism*, by Chancellor F. M. Hunter of Oregon; *Beacon Lights in a Murky World*, by U. S. Commissioner of Education J. W. Studebaker; and

Education and the Evolution of Democracy, by Dean E. M. Freeman of Minnesota.

Much consideration was also given to the problems of post-war adjustments. In an address entitled *The Challenge of Post-War Adjustment*, President Robert E. Doherty of the Carnegie Institute of Technology declared bluntly that "we must either plan for post-war adjustment or face the extremely high probability of national chaos." As "the source of ideas and constructive thought that brings these ideas to the practical stage," he placed the responsibility upon professional men in all fields. He made it clear that "the foundation of understanding of professional obligations to society and of capacity and knowledge to discharge these obligations must be laid in college," and that "this is a problem involving a crucial time element that lies squarely before college administrators and faculties."

The contribution of agricultural research to the post-war period was made the subject of one of the station subsection sessions. Here the principal speakers were Dr. T. W. Schultz of Iowa on *Public Welfare Problems in Agriculture* and Dean C. E. Ladd of Cornell University on *Problems of the Individual Farm Unit*.

As usual all matters of business were considered by the executive body of the association behind closed doors. The experiment station subsection carried on its discussion of research during the national emergency as a closed meeting, and many of the committee reports also were presented and considered only in sessions of this type, so that their content is not available.

Announcement was made of the election as president for the coming year of President J. D. Hoskins of Tennessee and as vice president Dean and Director C. B. Hutchison of California. Dean and Director Thomas P. Cooper of Kentucky was reelected secretary-treasurer, and President T. O. Walton of Texas and Dean and Director C. E. Ladd of Cornell were reappointed to the executive committee. A new committee, consisting of Presidents H. C. Byrd of Maryland, Alfred Atkinson of Arizona, and G. D. Humphrey of Mississippi, was set up to consider Federal relationships. It is hoped to present a complete list of section officers and committee appointments in the February issue of the *Record*. Following the usual procedure, it is also hoped to discuss the research aspects of the convention in greater detail at that time.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Research in biochemistry by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 446 (1941), pp. 402-405).—This has included studies of the tobacco plant (E. S. R., 85, p. 292), of isotopic nitrogen, of organic acidity, and of amino acids and proteins, all by H. B. Vickery.

[Chemical investigations by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt.* 1940, pp. 10-12, 13-14, 81, 82, 85, fig. 1).—The following topics are reported upon briefly: Nitrogen determinations on hybrid corn, by D. M. Doty; sugar loss on storage of inbred lines of sweet corn, by Doty, G. Smith, and J. R. Roach; nitrogen metabolism of the germinating soybean, by G. F. Roedel and H. R. Kraybill; fractionation of glycerides of liquid vegetable fats, by A. W. Kleinsmith, Kraybill, and M. H. Thornton; preparation of sterols from soybean oil, by K. E. Eldridge, Kraybill, and Thornton; nonfat constituents of soybean oil, by Thornton and Kraybill; sterol glucosides from expressed soybean oil, by Thornton, Kraybill, and J. H. Mitchell, Jr.; carbohydrates of the soybean, by E. D. Walter; improvements in photoelectric spectrophotometer, by F. P. Zscheile; carotenoid pigments of corn grain by Zscheile and J. W. White, of corn leaves by Zscheile, A. M. Brunson, and Roach, and of vegetables by Zscheile, B. W. Beadle, and Kraybill; vitamin A analysis, by Zscheile, C. L. Shrewsbury, Kraybill, and R. L. Henry; the spectroscopy of chlorophyll, by Zscheile and C. L. Comar; photosynthesis in monochromatized light, by Zscheile and L. F. Green; variation in composition of peppermint oil during distillation, by L. J. Swift; chemical and physical changes in pork and beef during freezing and storage, by Shrewsbury, F. G. King, C. M. Vestal, and N. E. Weitkamp; rusty coils and other factors affecting quality of mint oil, by F. C. Gaylord and K. I. Fawcett; and the development and refinement of the precision photoelectric colorimeter, by R. B. Withrow.

[Chemical investigations by the Nebraska Station] (*Nebraska Sta. Rpt.* [1940], pp. 29-31, 48, figs. 2).—These included work on baking quality in flour and vitamin content of various grasses at different stages of growth and cured under varying conditions.

[Chemical investigations at the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1940, pp. 22-24, 59-60).—Studies of rum fermentation, by R. Arroyo, F. Marrero, and L. Igaravidez, included work on effect of alcohol content, temperature, the H-ion concentration, predistillatory treatment of fermented mash, continuous v. discontinuous distillation, and mitogenetic radiation. Oil-yield tests of several varieties of castor-oil beans and of peanuts and of a sunflower variety are noted by E. Molinary Salés and the seed yield of *Salvia columbariae* by J. Simons. Work on ramie fiber is noted by J. Pastor Rodríguez.

The chemical constitution of natural fats, T. P. HILDITCH (*London: Chapman & Hall*, 1940, pp. XI+438, figs. 11).—This monograph, planned to give as complete an account as possible of the constitution of the fats, gives primarily

a descriptive presentation of their organic chemistry, with only incidental reference to their physiological functions or their technical applications. Detailed data, available from the literature on the acids combined in natural fats, indicated a close connection between the component acids in a fat and its biological source. Accordingly, a biological classification was selected as the basis for the order in which the various natural fats were considered. This method of approach is stressed in the first few chapters dealing with the component acids of (1) fats of aquatic flora and fauna, (2) fats of land animals, and (3) vegetable fats. Later chapters deal with the component glycerides of the natural fats (mainly qualitative investigations), the component glycerides of vegetable and animal fats, the constitution and properties of individual fatty acids, synthetic glycerides, and experimental technics employed in the quantitative investigation of fats. Relevant data published through 1938 and some in 1939 are used. With few exceptions, only those fats whose component acids have been defined in some detail by modern methods are included. About 420 fats from plant species, about 80 from land animals, and about 100 of aquatic origin are mentioned. Individual fats and waxes, individual fatty acids and glycerides, common animal and plant names and plant families are indexed.

Relative sweetness of sugars as affected by concentration, A. C. DAHLBERG and E. S. PENCZEK. (N. Y. State Expt. Sta.). (*Ice Cream Rev.*, 24 (1941), No. 12, pp. 42-44, 46, 48, 50, figs. 3).—A report of research noted elsewhere (E. S. R., 85, p. 293).

Some considerations of the polarographic method of quantitative analysis, S. OKUBO, C. LYMAN, and L. A. DEAN. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 2, pp. 67-78, figs. 8).—The authors briefly outline the electrochemical principles and development of polarographic analysis by means of the dropping-mercury electrode; describe an assembly including motor-driven rotary potentiometer and photographic recorder, improved dropping-mercury electrode, etc., and the connections and mode of operation of the completed set-up; and discuss possible analytical applications and the limitations of the method.

A new photometric method for the determination of iron, R. S. PEREIRA (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 417-428).—The sensitive color reaction of ferrous and ferric ions with protocatechuic acid was adapted to a simple and reliable procedure for determination of iron in biological materials. Of the colors formed by the interaction, the red color produced in alkaline solution was selected for the determination, since this was common to both ions. The procedure adopted after study of the influence of various factors involved wet ashing of the material (charred with concentrated sulfuric acid) with nitric and perchloric acids. The cold acid solution of the ash was treated with ammonium citrate, the protocatechuic acid reagent, and the ammonium hydroxide-ammonium sulfate reagent added dropwise until development of the characteristic red color. After dilution to volume, photometric measurements were made with a Zeiss-Pulfrich photometer, using a blank of the reagents in the one cell of the instrument. Since the color reaction follows the Lambert-Beer law, the concentration of the unknown was readily calculated. Copper, because of the formation of the blue copper-ammonium complex, interfered in higher concentrations but not at concentrations up to 0.8 mg. per 100 cc., a limit beyond likely concentrations in most biological materials. Precipitation of magnesium and of calcium were obviated, respectively, by carrying out the reaction in the cold and by the presence of excess citrate. Because of the

simplicity, rapidity, sensitivity, and lack of interference under the conditions of the method, the procedure is considered particularly applicable to biological materials. Analyses of beans (*Phaseolus vulgaris*), giving a range of from 0.011 to 0.013 percent, agreed very well with determinations by the permanganate procedure. Determinations on very small amounts of blood gave values from 55.34 to 56.64 mg. per 100 cc.

Determination of small amounts of zinc in plant materials: A photometric dithizone method, H. COWLING and E. J. MILLER. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 3, pp. 145-149, figs. 3).—A photometric, "mixed-color" dithizone method has been developed. Sodium diethyldithiocarbamate is used to eliminate the interference of other metals which form colored complexes with dithizone. It was found that diethyldithiocarbamate causes an appreciable reduction in the color intensity of all the dithizone extract, but, by keeping conditions constant in all extractions, a reproducible relationship between the color intensity of the dithizone extract as measured with a photometric colorimeter and the amount of zinc present was shown to be obtainable. Determination of zinc in the presence of other metals which form dithizone complexes, the recovery of added zinc from various plant materials, and the agreement between duplicate determinations proved the method to be accurate and remarkably free of interferences. A one-color method for the determination of zinc was found to be inferior to the mixed-color method. The light transmission curve of zinc dithizonate in carbon tetrachloride was determined with a spectrophotometer to guide filter selection for the photometric determination of zinc with dithizone.

Collagen determination in cooked meat, E. F. BELL, A. F. MORGAN, and A. DORMAN. (Univ. Calif.). (*Food Res.*, 6 (1941), No. 3, pp. 245-263, fig. 1).—The method of Mitchell et al.¹ for determining collagen in washed, ground beef by autoclaving and washing out the gelatin formed was modified so as to return to the washed samples granular residues previously discarded during the washing of the macerated meat previous to the autoclaving. These residues were found to contain collagen. Other details of the procedure were investigated, including the clearing of filtrates to remove nongelatin nitrogen. Prolonged heating alone, or with dilute acid, and salting out with NaCl, ZnSO₄, and Na₂SO₄ were found to give only small reductions in filtrate nitrogen, except for salting with Na₂SO₄ in all cases and NaCl in one case. Saturation with Na₂SO₄ threw down the gelatin almost completely from pure solutions, however, so that that method of clearing the filtrates was discarded. Tyrosine and tryptophan determinations made on many of the filtrates to determine their nongelatin content were generally unsuccessful, since the amounts present were too small for quantitative determination. In tests on raw and cooked meats the tyrosine content of the cooked samples appeared to be greater than that of the raw, but the tryptophan values were variable. Solution of non-collagen proteins by urea was attempted but was not successful.

Collagen determinations by the modified method applied to raw and cooked samples of beef, including shoulder fillet, rump, and sirloin butt, showed that the cooked meat in practically all cases contained less collagen than the raw, with the collagen ranging from 6 to 12 percent in the former case and from 8 to 17 percent in the latter. The loss of collagen in cooking, presumably through hydrolysis to gelatin, was greater in samples cooked for the longer period regardless of the cut or whether boiled in excess water or baked. In 23 experiments 22 percent of the collagen nitrogen of the raw meat was lost during

¹ Jour. Nutr., 1 (1928), No. 2, pp. 165-178.

cooking. It is concluded that the collagen content of both raw and cooked meat may be determined by the method suggested, and that the loss of collagen in the cooking of meat may be useful as a measure of the tendering produced.

The Pennsylvania method for determining the percentage of fat in dairy products, W. D. SWOPE (*Pennsylvania Sta. Bul.* 412 (1941), pp. [2]+18).—As a result of extensive tests in which 25 different reagents in varying amounts and combinations were tried, a method, known as the Pennsylvania method, for the determination of fat in dairy products has been evolved. The recommended reagents are 2 cc. of ammonium hydroxide 28–29 percent NH_3 , 3 cc. of butyl alcohol b. p. 117°C ., and 17.5 cc. of commercial sulfuric acid, diluted so as to have a specific gravity between 1.72 and 1.74. The same amount of reagents are used for all products tested, but some variation is recommended in the amount of sample used as indicated. After reagents are added to the test bottles the regular Babcock procedure is followed. This method is particularly applicable to products containing added sugar or chocolate. Of 529 fat determinations made by the Pennsylvania method on ice cream, ice cream mix, sweetened condensed milk, and chocolate milk, 84.3 percent were within ± 0.190 percent and 52.7 percent were within ± 0.090 percent of the fat determinations made by the Mojonnier method.

The influence of rancidity in milk upon the accuracy of the fat determination by the Mojonnier method, I. A. GOULD (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 19–22).—In each of six series of milk, four lots from the same batch were treated as follows: (1) Pasteurized (control lot), (2) homogenized and pasteurized immediately, (3) homogenized and pasteurized after 24 hr., and (4) homogenized and pasteurized after 48 hr. The average butterfat content of lots 1, 2, 3, and 4, as determined by the Mojonnier method, was 4.2505, 4.2990, 4.1714, and 4.1534, respectively. Fat acidities expressed as cubic centimeters of $1/N$ NaOH per 100 gm. of fat were 0.691, 2.68, 6.46, and 7.12, respectively. Thus it appeared that hydrolysis of the fat to the extent encountered in these milks did not greatly invalidate the results of the Mojonnier test.

Influence of the method of sampling on the accuracy of the acidity test of sour cream, I. A. GOULD (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 42–49, figs. 2).—Sixty-nine samples of cream testing less than 30 percent, 135 samples testing from 30 to 39.5 percent, and 60 samples testing over 40 percent were each sampled in three ways, (1) by weighing 9 gm., (2) by measuring with a 9-cc. pipette which was completely drained but not rinsed, and (3) by measuring as above, followed by rinsing the pipette. The average acidity of all samples as determined by titration with standard NaOH was 0.490, 0.423, and 0.483 under sampling methods 1, 2, and 3, respectively. Most of the volume-rinse samples varied less than 0.02 percent from the weighed samples, whereas most of the volume samples showed much greater variability. Increasing either the fat content of the cream or the acidity content resulted in a greater deviation of the volume-sample results from the weighed-sample results. Precautions to be observed in using the volume-rinse method under plant conditions are discussed.

Simplified determination of aneurin in the urine by the thiochrome method [trans. title], K. RITZERT (*Klin. Wchnschr.*, 19 (1940), No. 19, pp. 446–449, fig. 1).—Two features in the simplified technic described in detail are the use of preliminary heat treatment (50°C .) of the urine with HCl, followed by thorough shaking with butanol to remove nonspecific fluorescence, and the use of the Zeiss-Pulfrich step photometer in place of the quartz lamp for greater sensitivity of color comparison. Analyses of the urine of normal healthy persons

during the winter months of November through January gave 24-hr. thiamin values ranging from 90 to 385 μg .

Simplification of the Petering-Wolman-Hibbard method for determination of chlorophyll and carotene, H. G. PETERING, E. J. BENNE, and P. W. MORGAL. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, p. 236).—Instead of adding the solid barium hydroxide octahydrate reagent to the aqueous acetone extract, a saturated solution of barium hydroxide is added to the pure acetone extracts in a quantity suitable to remove all of the chlorophyll. This mixture is then treated as directed in the original procedure (E. S. R., 83, p. 438). This technic eliminates the necessity of preparing an active solid reagent from anhydrous barium hydroxide, of having to handle finely divided barium hydroxide octahydrate, and of keeping the solid reagent free from carbonate. During the preparation of the solution the carbonate is removed because of its insolubility, and the addition of dissolved barium hydroxide to the acetone extract produces a very finely divided precipitate of barium hydroxide octahydrate which is extremely active.

A photoelectric colorimeter-fluorimeter, D. K. FROMAN and W. D. McFARLANE (*Canad. Jour. Res.*, 18 (1940), No. 8, Sect. B, pp. 240-245, figs. 3).—A photoelectric colorimeter of the compensating two-photocell type is described and its construction indicated by diagram. It is simple in design and relatively inexpensive to construct. By changing the lamp and filters it can be adapted to fluorescence measurements. Operation, theory, and performance (which is considered satisfactory) are discussed.

Pasture studies.—XXI, An improved thiochrome method for the estimation of vitamin B₁, W. D. McFARLANE and R. A. CHAPMAN (*Canad. Jour. Res.*, 19 (1941), No. 5, Sect. A, pp. 136-142, fig. 1).—The thiochrome method, as applied to foodstuffs by Pyke (E. S. R., 85, p. 701), has been modified by the use of (1) hydrogen peroxide to destroy interfering pigments in both blank and test solutions before extraction with isobutanol, and (2) the fluorimeter of Froman and McFarlane, noted above, for the final determination.

Polarographic determination of riboflavin (vitamin B₂) and other vitamin B factors, J. J. LINGANE and O. L. DAVIS. (Univ. Calif.). (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 567-574, figs. 3).—Riboflavin, thiamin, nicotinic acid, pantothenic acid, and pyridoxine were all found to be reducible at the dropping mercury electrode and amenable, therefore, to polarographic determination. Preliminary results concerning the polarographic behavior of these substances as pure compounds are presented. The diffusion current of riboflavin (the most easily reducible of the group) in a phosphate buffer of pH 7.2 was found to be directly proportional to its concentration over the range of 5×10^{-6} to 10^{-4} M (2-50 p. p. m.). In the phosphate buffer at pH 7 the diffusion current of thiamin was not very well defined and was partly masked by the evolution of hydrogen from the buffer acid. In unbuffered KCl solutions, however, a fairly good wave was obtained. At a pH greater than 7 the thiamin was unstable. Nicotinic acid gave a well-defined and easily measurable wave in a tetramethylammonium borate buffer at pH 9, and a fairly well-defined wave in unbuffered solutions of KCl (after neutralization of the nicotinic acid with NaOH), but in buffers of pH less than 7 the discharge of hydrogen masked the wave of nicotinic acid. Simultaneous determination of these three members of the vitamin B complex (using nicotinic acid as the sodium salt) in unbuffered 0.1 N KCl solution gave separate and well-defined waves for each of the substances. Preliminary experiments showed that the riboflavin content of dilute hydrochloric acid extracts of yeast could be determined by the

polarographic technic after the pH was adjusted to about 7 with sodium hydroxide.

Chemical determination of nicotinic acid: Inhibitory effect of cyanogen bromide upon the aniline side reactions, D. MELNICK and H. FIELD, JR. (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 53-58).—Experimental proof is presented to support the validity of omitting aniline from the blank test in the method noted previously (E. S. R., 85, p. 584). It is shown that while aniline reacts directly with substances in the hydrolyzates to give colors indistinguishable from those produced with nicotinic acid, these interfering side reactions do not occur in the presence of cyanogen bromide.

Influence of the excretion of other pyridine compounds upon the interpretation of the urinary nicotinic acid values, D. MELNICK, W. D. ROBINSON, and H. FIELD, JR. (*Jour. Biol. Chem.*, 136 (1940), No. 1, pp. 131-144).—Various pyridine compounds other than nicotinic acid have been tested with the cyanogen bromide-aniline reagents to determine their interference in the method for estimating nicotinic acid in blood and urine, as noted above.

Nicotinamide was found to be stable in acidified urine over a period of more than 30 days. Among the pyridine compounds present in urine, nicotinic acid (which alone of the substances other than nicotinic acid and its amide has antiblacktongue activity), pyridine, and nicotine gave color reactions and trigonelline hydrochloride and vitamin B₃ hydrochloride did not. Nicotinic acid proved to be more stable than nicotinic acid or nicotinamide to acid hydrolysis, while pyridine and nicotine were stable to alkaline hydrolysis. Trigonelline was completely stable to acid hydrolysis but susceptible to alkaline hydrolysis. On the basis of these differences, hydrolytic procedures have been used in the preparation of 3 aliquots of the 24-hr. urines as follows: (1) Hydrolysis with 4 N HCl for ½ hr., (2) hydrolysis with the same concentration of the acid for 5 hr., and (3) hydrolysis with 9 N NaOH for ½ hr. The first sample is believed to include all of the voided nicotinic acid, nicotinamide, free pyridine, nicotine, two-thirds of the nicotinic acid, and any other unknown pyridine compounds which react with the reagents; the second sample the same constituents, together with all of the nicotinic acid; in the third sample, which is used to estimate the trigonelline, the increased yield of nicotinic acid over and above that of sample 2 is considered to represent one-third of the excreted trigonelline. Coffee consumption was found to result in a markedly increased excretion of trigonelline, with no change in the values obtained in the hydrolyzates of samples 1 and 2. Smoking was irregular in its effect. In some individuals it increased the urinary excretion of trigonelline, while in others free nicotine was excreted.

The possible identity of vitamin H with biotin and coenzyme R, P. GYÖRGY, D. B. MELVILLE, D. BURK, and V. DU VIGNEAUD. (Cornell Univ. et al.). (*Science*, 91 (1940), No. 2358, pp. 243-245).—Observations pointing to the identity of coenzyme R (E. S. R., 70, p. 601) and biotin (E. S. R., 82, p. 460) are reviewed, and similarities in the occurrence and physical and chemical properties of vitamin H (E. S. R., 84, p. 285) and both biotin and coenzyme R are summarized, including data on the vitamin H, biotin, and coenzyme R assays of various liver concentrate electro-dialyzates.

On the identity of vitamin H with biotin, V. DU VIGNEAUD, D. B. MELVILLE, P. GYÖRGY, and C. S. ROSE. (Cornell Univ. et al.). (*Science*, 92 (1940), No. 2377, pp. 62-63).—Further proof of the identity of vitamin H with biotin and coenzyme R is presented briefly in the successful use of an ethyl alcohol solution of crystalline biotin methyl ester in curative tests on rats showing definite

vitamin H deficiency symptoms. The minimum effective dose when administered subcutaneously was found to be 0.1 γ per rat per day for 30 days.

A further note on the identity of vitamin H with biotin, P. GYÖRÖGY, C. S. ROSE, K. HOFMANN, D. B. MELVILLE, and V. DU VIGNEAUD. (Cornell Univ. et al.). (*Science*, 92 (1940), No. 2400, p. 609).—The vitamin H activity of biotin, as demonstrated above, has been confirmed by additional experiments with a more highly purified crystalline biotin methyl ester isolated from a liver concentrate. This product was found to have a sharp melting point at 166°–167° C., uncorrected, which is 18°–19° higher than that of the product previously used, and in tests by the yeast-growth method gave a much higher vitamin H value, 27,000 vitamin H units per milligram. Curative vitamin H tests on rats gave results in agreement with this high potency. The crystals were found by D. Burk to have a maximum coenzyme R activity when tested with *Rhizobium trifolii* Strain 209, and by D. W. Woolley to be effective in promoting growth of *Clostridium butylicum* Strain 21. The extremely potent vitamin H activity is thought to be conclusive evidence that vitamin H and biotin are identical.

Vitamin K activity of certain naphthols and tetralones, M. TISHLER, L. F. FIESER, and W. L. SAMPSON (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 7, pp. 1881–1882).—Additional compounds (E. S. R., 84, p. 440), some of which could readily revert to 2-methyl-1,4-naphthoquinone and others of which could not, were assayed for their antihemorrhagic activity. The results gave further evidence that derivatives of vitamin K₁ might function not as such but after their biological transformation into quinones.

Nature of the by-product in the synthesis of vitamin K₁, M. TISHLER, L. F. FIESER, and N. L. WENDLER (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 8, pp. 1982–1991, figs. 3).—The nature of the byproduct in the low-yield synthesis of vitamin K₁ (E. S. R., 83, p. 735) was studied. The experiments and the findings, reported in detail, are summarized as follows:

“The byproduct isomeric with 2-methyl-3-phytyl-1,4-naphthoquinone in the vitamin K₁ synthesis is shown to be 2-methyl-2-phytyl-2,3-dihydro-1,4-naphthoquinone. The substance, which has been characterized by degradation, aluminum isopropoxide reduction, and other reactions affording crystalline derivatives, has marked antihemorrhagic activity and can be converted in small part into vitamin K₁ by pyrolysis. The isomeric naphthocopherol has been prepared by the action of stannous chloride and acid on vitamin K₁ and converted to γ -hydroxy- β,γ -dihydrovitamin K₁. This substance yields a hydroquinone diacetate on reductive acetylation.”

Extensions of the vitamin K₁ synthesis, L. F. FIESER, M. TISHLER, and N. L. WENDLER (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 10, pp. 2861–2866).—This paper presents a more detailed account of a study noted earlier (E. S. R., 84, p. 440).

Hydro, oxido, and other derivatives of vitamin K₁ and related compounds, M. TISHLER, L. F. FIESER, and N. L. WENDLER (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 10, pp. 2866–2871).—This paper presents the details of preparative work which has been reported briefly in part in earlier reports by Fieser et al. (E. S. R., 84, p. 440) and by Tishler, Fieser, and Sampson, as noted above.

A quantitative reduction-oxidation method for the estimation of vitamin K₁ and associated quinones and naphthoquinones, N. R. TRENNER and F. A. BACHER (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 745–755, fig. 1).—A method is described whereby many quinonelike substances whose standard oxidation-reduction potentials, E₀, are less than about 0.5 v. may be assayed. In principle, the method consists of (1) catalytic reduction (with a nickel catalyst)

of the quinone to the hydroquinone and (2) reoxidation of an aliquot part of the latter with 2,6-dichlorophenolindophenol, a dye which is stable against air oxidation. The preparation of the dye solution, the solvent, and the nickel catalyst is noted, the apparatus is illustrated by diagram and described, the procedure is given in detail, and summaries of typical results are presented and discussed. The method was successfully applied to the assay of vitamin K₁ samples dissolved in castor, sesame, or peanut oils providing the oils were diluted about 1:5 with 95 percent *n*-butanol.

The bioassay of vitamin K, S. ANSBACHER (*Jour. Nutr.*, 21 (1941), No. 1, pp. 1-12).—Under the classification of preventive and curative bio-assays, the several methods in use by various groups of workers are outlined very briefly and compared as to their efficiency, the evidence indicating that vitamin K is best estimated by the curative method. The approximate relationships of various vitamin K units are discussed and indicated by tabulation, and the results obtained in various laboratories upon using 2-methyl-1,4-naphthoquinone as a standard vitamin K preparation are reviewed.

The determination of pyruvic acid in blood in the presence of acetoacetic acid, D. KLEIN (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 311-316).—In this method, involving the isolation of sodium pyruvate 2,4-dinitrophenylhydrazone and the reaction of that compound with strong alkali to form a red derivative, the method of Peters and Thompson (*E. S. R.*, 73, p. 724) is modified to avoid the error arising with high concentrations of acetoacetic acid, which also forms a colored hydrazone. Improvements suggested by the more rapid methods of Lu (*E. S. R.*, 82, p. 587) and Bueding and Wortis (*E. S. R.*, 85, p. 852) are also incorporated. In the procedure outlined the pyruvate in the blood is first stabilized with iodoacetate and the proteins are precipitated with tungstic acid rather than acetoacetic acid, since the acidity of the latter causes a marked destruction of pyruvate hydrazone in the ethyl acetate extract obtained in a subsequent step. The 2,4-dinitrophenylhydrazine reagent is added to the tungstic acid filtrate, and the hydrazones formed are extracted with ethyl acetate. The extract is allowed to stand in the dark for from 18 to 24 hr. to permit decomposition of the acetoacetate hydrazone. The pyruvate hydrazone is extracted from the ethyl acetate with 1 percent sodium carbonate solution. The alkaline extract, washed with ethyl acetate to remove any free hydrazine or interfering hydrazones, is made up to volume, and color is developed by the addition of 4 *N* NaOH. The pyruvate estimation is carried out in a photoelectric colorimeter. Protocols presented indicate that the modifications described avoid interference by acetoacetic acid and permit from 84 to 94 percent recovery of added pyruvic acid from blood.

Precooling and drying of washed Irish potatoes, W. D. POOLE and H. T. BARR (*Louisiana Sta. Bul.* 332 (1941), pp. 23, figs. 10).—Washing was found to increase tendency to rot, and drying and cooling by means of bunker fans helped to prevent such decay. Other improvements helping to diminish these losses were the use of a potato digger in place of a middle breaker, resulting in less cutting and bruising, substitution of crates for sacks in hauling from the field, and replacement of the very inefficient precooling and drying practices of some shippers by better methods. An efficient bunker-fan unit for precooling and drying potatoes can be made at a relatively low cost. The mechanical refrigeration unit had a lower air delivery than the bunker-fan units, but the fans showed a more even temperature distribution throughout the car. A more thorough drying resulted when bunker-fan units were operated while the car was being loaded before icing the bunkers. Greater moisture loss was obtained from crates than from sacks during precooling by the bunker-fan method. It was found not

advisable to have a potato temperature below 55° F. when shipping under standard ventilation.

Stability of carotene in dehydrated sweet potatoes, J. H. MITCHELL and E. J. LEASE (*South Carolina Sta. Bul. 333 (1941), pp. 8, fig. 1*).—The rate of decomposition of carotene in certain samples of dehydrated sweetpotato was quite rapid when these were stored in cloth sacks or loosely stoppered bottles. The carotene was very stable, however, when the dehydrated sweetpotato was sealed in metal cans under vacuum or in such an inert atmosphere as carbon dioxide or nitrogen, 76 percent of the carotene of sweetpotato flour still being present after storage for 1 yr. in a vacuum-sealed metal can. Crude cottonseed oil had a temporary stabilizing effect on the carotene of sweetpotato flour stored at room temperature, but when the storage temperature was increased to 37° C. the cottonseed oil became rancid, and the rancid-fat peroxides then quickly decomposed the carotene. The carotene of raw sweetpotatoes was more stable than the carotene of sweetpotato flour.

Processing and chemical investigations of taro, J. H. PAYNE, G. J. LEY, and G. AKAU (*Hawaii Sta. Bul. 86 (1941), pp. 42, figs. 6*).—The authors find that taro can be converted into flour by cooking, peeling, grinding, refrigeration, drying, and milling. This flour can be substituted for from 15 to 20 percent of wheat flour in a wide variety of baked goods, with an increase in yield due to higher absorption and improved keeping qualities of the baked product resulting from the higher moisture content. A beverage powder, which mixes readily with milk and water and is considered highly palatable, can be prepared from cooked taro by adding flavoring and sweetening agents, and drum drying. Taro can be used in the preparation of such breakfast foods as grits, shreds, and flakes by cooking, flavoring, drying, and toasting. Taro products have been shown to be of value in diets for wheat-allergy cases. Taro can be canned as a substitute for potatoes or other starchy crops. Complete analyses of two wetland and upland varieties of taro are recorded.

AGRICULTURAL METEOROLOGY

Weather conditions (Louisiana Sta., Northeast Louisiana Sta. Bien. Rpt. 1939-40, pp. 3-4).—Weather notes and tabulated temperature and rainfall data at St. Joseph are given.

Fifty years' weather in Kansas City, Mo., 1889-1938, A. M. HAMBICK and H. H. MARTIN (*U. S. Mo. Weather Rev. Sup. 44 (1941), pp. III+53, figs. 34*).—In this contribution, "it is intended to present, in detail, sufficient meteorological data to depict a fairly representative picture of the weather which has been experienced in a city, located in the 'Heart of America.'"

Agricultural meteorology: Seasonal incidence of rainless and rainy periods at Winnipeg, Swift Current, and Edmonton, J. W. HOPKINS (*Canad. Jour. Res., 19 (1941), No. 8, Sect. C, pp. 267-277, figs. 2*).—"The frequency of sequences of consecutive days without rain and with rain at each of the above-named meteorological stations has been determined from their records of daily precipitation for the months April to September of the years 1916 to 1937. It is inferred from these frequencies that rainy or rainless days do not in general occur entirely at random, but that the same kind of weather tends to persist over successive days. The statistics have also been used to estimate the expectation of rainless periods. At all three stations, this is least in midsummer (June and July) and greatest in spring and autumn."

A micro-climatic study: Shade and its modification of the physical environment, G. D. B. DE VILLIERS (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 215 (1940), pp. 53, figs. 17; Afrikaans abs., p. 36*).—The broad outline

of the problem of delayed foliation is indicated, with special reference to peach trees, and the more important major aspects are discussed. In this microclimatic study in South Africa, the environal factors considered in relation to peach trees are radiation, air temperatures, evaporation, light intensity, and soil moisture and temperature. Particular attention is also given to the modification of the environment by shade during winter. The major effect of shade on radiation temperatures was to ameliorate excessively high temperatures, particularly for June and July. The mean weekly minimum radiation temperatures for 4 a. m. to 8 a. m. were on the whole lowest in the exposed positions and rose progressively in the direction of the shelter, unless influenced by other factors. In June this difference in mean weekly temperature from the exposed to the sheltered position amounted to about 3° F. Maximum air temperatures were largely influenced by shade, and this effect was especially pronounced in warm winter weather. Minimum temperatures were less affected. A decrease of 0.46 sq. in. in the evaporation index was observed in some cases. For May-July, shade decreased the light intensity by about 90 percent as compared to exposed positions. A decrease of 3°-4° in the mean monthly temperature of the soil at a depth of 1 ft. and an increase in soil moisture as percentage of dry weight by 2 percent were obtained. The effect of an artificial shade (reed shelter) on the northwestern side of a tree on the physical environment was also investigated, and results similar to those outlined above were obtained as to radiation, air temperature, and evaporation indexes. It is believed that radiation may be used as a fundamental criterion for the study of delayed foliation in peaches.

An approach to the study of rainfall interception by forest canopies, C. L. WICHT (*Jour. So. African Forestry Assoc., No. 6 (1941), pp. 54-70, pl. 1, figs. 2*).—A critical account is given of the history of rainfall interception investigations. An experiment in a stand of poplars is then described, and through the aid of the data obtained the experimental method and technic are discussed. It is pointed out that the method of paired stations inside and outside the forest is not entirely satisfactory, and three improvements are suggested, viz, rainfall should be gaged above the canopy as well as in an adjacent open field, all gages should be sheltered from the wind, and the gaging technic used in the forest should be duplicated in the open and above the canopy. Penetration measurements are analyzed to test the accuracy of the sampling technic, and it is shown that the variation in drip and direct penetration under various parts of the canopy is considerable. To obtain a mean estimation in the poplar stand (with preselected error of 5 percent), it was calculated that more than 19 gages would be required. A technic for measuring stem run-off was also tested, and minor improvements are recommended.

Rainfall interception and penetration data in this stand indicated that 32.27 in. of rain, or about 92 percent of downpour in the open, reached the forest floor. Penetration and interception varied greatly in amount and nature, according to whether the trees were in leaf or bare. Direct penetration and drip through the trees in leaf was 79.7 percent, through bare trees 82.1 percent. Stem run-off from trees in leaf was 6.1 percent, from bare trees 14.9 percent. Interception by trees in leaf was 14.2 percent, by bare trees 3 percent. The daily estimations were too few and too inaccurate to determine satisfactorily the correlation between penetration and interception and daily amounts and intensities of rainfall. The data indicated that some penetration in the form of drip and stem run-off was derived from mist condensation on leaves, twigs, branches, and stems of trees. There are 32 references.

Droughts in South Africa: A preliminary study of their extent, severity, and frequency of occurrence since 1904, L. LEVINKIND (*Farming in So. Africa*, 16 (1941), No. 180, pp. 84-89, figs. 5).

SOILS—FERTILIZERS

[Soil investigations of the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 446 (1941), pp. 424-426, 427-429).—Orchard soil studies to determine probable relationship between boron deficiency and the physiological disease known as internal cork, the effects of acid-reacting fertilizers on various soil properties, the relation of cover crops to nitrogen losses through leaching, soil management for vegetable production, the effect of erosion on soil depletion, the selection of fertilizers for various crops, forest-nursery fertilizer studies, vitamin B₁ and starter solution, and the effect of litter removal and liming of forest soils are reported by M. F. Morgan.

[Soil investigations by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt.* 1940, pp. 25-26, 29, 33-34, 38, figs. 2).—The following topics are reported upon briefly: Soil conservation investigations, by I. D. Mayer; potash deficiency on heavily limed land, by G. P. Walker; investigations with ammonia forms of nitrogen on the nitrogen-deficient soils, by H. L. Cook, A. J. Ohlrogge, and G. D. Scarseth; the availability of magnesium compounds for plants, by M. Drake and Scarseth; crop residues as a valuable source of plant food, by R. R. Mulvey; the influence of mineral fertilizers on symbiotic nitrogen fixation, by J. L. Roberts and F. R. Olson; and the influence of phosphatic and potassic fertilizers on nitrification, by B. E. Hahn, Olson, and Roberts.

[Soil investigations by the Nebraska Station] (*Nebraska Sta. Rpt.* [1940], pp. 5-9, figs. 2).—Progress on soil-erosion control and soil-moisture conservation investigations (coop. U. S. D. A.), commercial-fertilizer tests, soil studies on solubility of soil phosphorus, soil organic matter, and factors affecting the permeability of soils to water is reported.

[Soil investigations by the North Carolina Station]. (Partly coop. U. S. D. A. et al.). (*North Carolina Sta. [Bien.] Rpt.* 1939-40, pp. 51-55, fig. 1).—Work is noted on results of soil management surveys, organic matter as a help to granulate soils and reduce erosion, drainage and aeration of soils as determined by the size of the soil pores, crop production related to soil aeration, North Carolina soils low in available boron, and field experiments on the comparative value of different phosphate fertilizers.

[Soil investigations by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1940, pp. 21-22).—The volume weight, total and available phosphorus, and chemical correlation of Puerto Rico soil series are reported by J. A. Bonnet. The relation of chemical tests to field response of some tropical crops to phosphate and potash fertilizers is reported by Bonnet and A. Rivera Brenes.

The quantitative spectroscopic analysis of soils, F. W. Fox and R. A. GOODWIN. (*Iowa State Col.*). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 2, pp. 119-125, figs. 2).—Results are reported on the analysis of soils and soil solutions, using a D. C. carbon arc as the spectroscopic source. The advantages and disadvantages of the spectroscopic method of analysis are considered. Information is needed on the effect of organic matter on the analyses.

Techniques and tools for determining the physical properties of soils, V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 3-6).—A general review of the application of physical laws to the physical properties of the soil is presented. The accomplishments of the station in developing technics and tools for determining physical properties are reviewed. Emphasis is placed

on developments in the measurement of soil water and on the determination of the mechanical analysis of soil by the hydrometer method.

Surface condition of soil and time of application as related to intake of water, F. L. DULEY and L. L. KELLY. (Coop. Nebr. Expt. Sta.). (*U. S. Dept. Agr. Cir. 608 (1941)*, pp. 31, figs. 25).—This circular reports an infiltration study of eight soils in southeastern Nebraska. Complete data are given for plats on only two soils, Marshall silt loam (heavy subsoil) and Lancaster sandy loam. Rates of intake under different surface conditions were wide and differed at successive applications. In determining intake rate no attempt was made to prevent lateral seepage into the soil beneath the 6-in. plat boundaries. The intake rate recorded is the difference between the rate of application and the rate of run-off. Tests on bare-cultivated, straw-covered, and grassed plats (on Marshall silt loam) show the intake of water before the infiltration rate became relatively constant to be greater on the straw-covered and grassed plats than on the bare plats and the final rate of intake on the straw-covered plats to be much higher than that on either the bare or grassed plats. Final rates on straw-covered and bare plats ranged from 1.9 to 0.21 in. per hour on Marshall silt loam and from 1.36 to 0.32 in. per hour on Lancaster sandy loam. The low intake rate on bare plats is attributed to the formation of a compact layer on the surface of the soil. Application of water to a plat from which the straw cover had been removed after a test giving a final intake rate of 1.24 in. per hour resulted in a final intake rate of 0.44 in. per hour. The drop is attributed to a change in surface condition rather than "wetness" of the soil. On the grassed plat the final intake rate ranged from 1.63 in. per hour to 0.42 in. in five tests on three consecutive days. The amount absorbed during the first test was 8.95 in., and the final rate, at the end of the 3 hr., was 1.63 in. per hour. On the day following the last of the five tests the grass was clipped and swept off the plat, and a 3-hr. test at approximately the rate of application used in the previous test was made. During this test, 2.09 in. was absorbed, and the final rate was 0.63 in. per hour.

Loss of soil and water influenced by the intensity of rainfall, T. N. JONES. (Coop. U. S. D. A.). (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 6, p. 8).—In connection with two consecutive years of crop failures and heavy soil losses in northeastern Mississippi, the author discusses data obtained from soil-erosion plats of Houston clay having slopes of from 2.5 to 12.5 percent and planted to cotton, clean cultivated, the figures tabulated covering the period from June 6 through July 15, 1940. All rows on these plats were run on the contour. During this period the rainfall totaled 23.19 in. The percentage of water run-off varied from 0 to 81. Soil losses as given range from 3.45 to 16.82 tons per acre.

Little likelihood of damage to soil in "dusting" program, J. PITNER (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 7, pp. 1, 2).—Much larger applications of calcium arsenate than those normally applied for bollweevil control were added to Houston clay loam, Memphis silt loam, Ruston sandy loam, Sarpy silty clay loam, and Sarpy fine sandy loam under field conditions without harmful effects on the production of cotton.

Nutrients, drainage, texture, all required for soil productivity, R. COLEMAN (*Miss. Farm. Res. [Mississippi Sta.]*, 4 (1941), No. 7, pp. 1, 2).—The author discusses the general requirements for a productive soil, with special emphasis on the nutrient level, effect of soil texture, and the importance of proper drainage for successful crop production.

Humus for Oregon soils, R. E. STEPHENSON (*Oregon Sta. Cir. 143 (1941)*, pp. 23).—General soil and plant relations leading to the formation of organic

matter in soils are revealed. Data are presented on the effect of various processes of humus depletion. The importance of maintaining a supply of humus in the soil is considered both from the standpoint of keeping the soil in good condition and obtaining maximum crop yield. Micro-organisms are discussed in relation to the breaking down and liberation of nitrate, sulfate, lime, potash, and phosphate for crop utilization. The author emphasizes the importance of keeping a supply of active organic material in the soil. Methods of providing organic material, such as the use of legumes, green manure, stable manure, crop residues, and composting various plant materials, are considered.

Sorption of potassium and ammonium by Hawaiian soils, A. S. AYRES. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 2, pp. 93-106, fig. 1).—Sorption was found to decrease with increasing exchangeable potassium content and to be subjected to a limiting concentration, specific for any given soil, below which no sorption occurs, whereas above this limiting concentration sorption increases with increasing concentration. Ammonium sorption also was found to increase with increasing concentration. Sorption of either base increased with the proportion of calcium saturation. Hydrogen-saturated soil could be made to take up more potassium and ammonium from large volumes of the sulfate solutions than any like treatment with chloride solutions. Normal soils treated as in field practice showed no difference between the sulfates and the chlorides. Ammonium sorption increased with decreasing rate of passage of the solution through the soil.

Nitrogen fixation and soil fertility exhaustion by soybeans under different levels of potassium, C. E. FERGUSON and W. A. ALBRECHT (*Missouri Sta. Res. Bul.* 330 (1941), pp. 52, figs. 14).—An electro-dialyzed colloidal clay of known composition was used as a carrier of potassium in combination with constant amounts of calcium, magnesium, phosphorus, and, in some instances, sulfur. Barium was used to vary reciprocally with potassium for the purpose of maintaining a constant degree of saturation.

In nodulated cultures nitrogen fixation increased as the available potassium increased, when constant levels of the other elements were maintained. The ratio of nitrogen to carbohydrate was approximately constant. Plants which were not nodulated were very low in nitrogen and did not fix nitrogen, but lost to the soil an average of 23.1 percent of the initial seed supply. The carbohydrate contents of these plants increased very greatly with potassium treatment, both in percentage and in total. Crops grown on soils depleted in fertility were nodulated but failed to fix nitrogen. They produced increasing amounts of carbohydrates as more potassium was present in the plants, however. Larger potassium treatments caused a decrease in the total amounts of magnesium taken. All the media tended to approach the same degree of saturation of cations other than barium when cropped successively. The efficiency of phosphorus removal by soybeans was increased greatly by potassium treatment. Under certain conditions the crop contents of potassium, nitrogen, and phosphorus were less than those present in the planted seed. The cations calcium and magnesium were always present in the harvested crop in excess of the amounts supplied by the seed.

Field experiments with potash fertilizers, T. E. ODLAND and T. R. COX (*Rhode Island Sta. Bul.* 280 (1941), pp. 30, figs. 4).—Results on the response of various crops to sulfate of potash, muriate of potash, kainite, and sulfate of potash-magnesia are compared for the period 1924-40. No consistent differences were evident in response to the various carriers of potash in different years or among various crops. It is reported that neither sulfur nor magnesium was found to be of any benefit under conditions where ample lime had been used. The authors report that there was some indication that the large concentration of salts other than potash in the kainite and sulfate of potash-magnesia may have

been detrimental to some crops in certain years. It is also suggested that sodium may have been of some benefit to certain crops where the potash was insufficient. Cereals, grasses, and carrots showed the least response to potash, with potatoes, clover, alfalfa, tomatoes, and mangels responding most to extra potash fertilization. A study of the percentage of potash in several crops grown under different levels of potash showed that an increase in the potash applied in the fertilizer in every instance produced an increase in the percentage of potash found in the crop. The authors conclude that the cost of potash per unit should be the governing factor in deciding which form is most desirable for the user.

Greenhouse tests of the availability of phosphorus in certain phosphate fertilizers, P. E. KARRAKER, H. F. MILLER, C. E. BORTNER, and J. R. TODD (*Kentucky Sta. Bul.* 413 (1941), pp. 57-86).—Greenhouse tests with 9 sources of phosphorus from 1934 to 1939 are reported. Various crop plants were grown in jars of soil to which the several fertilizers were added, and then the plants were analyzed to determine how much of the phosphorus was taken up. The fertilizers were applied so as to supply an equivalent amount of phosphorus, and with this system the less readily available rock and colloidal phosphates were handicapped. As determined with 9 kinds of crops and 10 different lots of soil, ordinary superphosphate, triple superphosphate, dicalcium phosphate, calcium metaphosphate, and fused rock phosphate were practically equally available in the greenhouse tests. Tricalcium phosphate was appreciably less available than the others, with rock and colloidal phosphates very much less available. Field tests were found to agree fairly well with the greenhouse tests, except that the relative availability of the tricalcium phosphate and rock phosphate was greater in the field. Liming decreased materially the availability of rock phosphate and colloidal phosphate and decreased somewhat the availability of tricalcium phosphate in the greenhouse tests.

Weitere Versuche über die Wirkung des Spurenelements Vanadin auf das Pflanzenwachstum [Further research on the effect of the minor element vanadium on plant growth], S. GERICKE (*Bodenk. u. Pflanzenernähr.*, 23 (1941), No. 5-6, pp. 342-350).

Putting fertilizer where it can do the most good, F. E. BEAR. (Rutgers Univ.). (*Amer. Fert.*, 95 (1941), No. 3, pp. 10-11).—This is a general discussion of the methods of the application of fertilizers in relation to their recovery by crops. The effect of fixation of phosphates and potash in relation to the recovery is pointed out. There is indicated need for additional studies on placement of fertilizers to provide the necessary information on needed changes in fertilizer practice.

Commercial fertilizers in Kentucky in 1940, J. D. TURNER, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Regulat. Ser. Bul.* 26 (1941), pp. 59).—Data on inspection and analyses of Official samples of commercial fertilizer sold in Kentucky during 1940 are presented in this bulletin.

Registration, labeling, and inspection of commercial fertilizers, 1940, M. F. MILLER, L. D. HAIGH, E. W. COWAN, and L. L. WISEMAN (*Missouri Sta. Bul.* 432 (1941), pp. 56).—This bulletin summarizes the requirements of the State law and presents, for 1940, the usual report of guaranteed analyses.

AGRICULTURAL BOTANY

The Hawaiian planter.—I, His plants, methods, and areas of cultivation, E. S. C. HANDY (*Bernice P. Bishop Mus. Bul.* 161 (1940), pp. [I]+III+227, pls. 8, figs. 21).—This is an ethnologist's study of cultivated plants introduced into Hawaii before discovery of the islands by Europeans, the work serving as a

background for further study of Hawaiian culture. The arrangement is by crops, taro and sweetpotato being given by far the most attention, but with yam, banana, sugarcane, breadfruit, coconut, pandanus, kukui, kou, hau, wauke (paper mulberry), olona, awa, ti, gourds, arrowroot, turmeric, bamboo, ilima, hibiscus, pineapple, and wild foods also considered. Common English or Hawaiian names are used for the plants described. Frequent lists of Hawaiian equivalents for names of plants, plant parts, and descriptive terms are given throughout the text. Each crop plant is given consideration with respect to varieties, planting, cultivation, uses, and localities where grown. The native names for 346 kinds and varieties of taro are listed, and a key and descriptive list of 67 of them based on the author's collections are included. The separations are based largely on color differences. Maps of the islands in the Hawaiian group and descriptions of localities where taro and some of the other crops are grown are detailed. The bulletin is of interest to those concerned with the growing, propagation, and utilization of these tropical plants, as well as to those seeking information on native Hawaiian crop plants for ethnological or other reasons.

A manual of the higher plants of Oregon, M. E. PECK (*Portland, Oreg.: Binfords & Mort, [1941], pp. 866, [pl. 1, figs. 91]*).—Available knowledge of the plant life of Oregon, so far as published sources are concerned, is said to be rather meager. The present work is the outcome of many years of collecting and study of the plants of nearly every section of the State, and the specimens obtained now comprise the main portion of the herbarium of Willamette University. With but relatively few exceptions, the species descriptions are drawn directly from the specimens in hand from these collections. The manual gives a more comprehensive coverage of the plants of Oregon than has hitherto been available in any similar work. The number of species included is 3,203, representing 701 genera and 118 families of ferns and seed plants. Since the majority of the higher plant species occurring throughout the Pacific Northwest are included, the work will be of value in adjoining States.

North American Ranunculi, I, L. BENSON. (Univ. Ariz.). (*Bul. Torrey Bot. Club, 68 (1941), No. 3, pp. 157-172*).—This initial contribution of a series of taxonomic studies of the genus *Ranunculus* deals with the first seven species and a complex of varieties of the subgenus *Euranunculus*, section *Chrysanthe*. New taxonomy and a key to the species are included.

Euphorbia corollata in the Appalachians, J. B. S. NORTON. (Univ. Md.). (*Castanea, 6 (1941), No. 5, p. 79*).

Taxonomic studies, L. BENSON. (Univ. Ariz.). (*Amer. Jour. Bot., 28 (1941), No. 5, pp. 358-364, figs. 7*).—The following topics are discussed: A revision of the semaphore grasses—the genus *Pleuropogon*, studies of southwestern cacti, and reclassification of some milkweeds from Arizona and Mexico and of some clovers from Arizona and New Mexico.

Plant ecology, W. B. McDOUGALL (*Philadelphia: Lea & Febiger, 1941, 3. ed., rev., pp. 285, [pl. 1], figs. 118*).—This is a thorough revision of the textbook previously noted (*E. S. R., 57, p. 514*), but with the same general order of presentation.

[**Botanical studies by the Indiana Station**] (*Indiana Sta. Rpt. 1940, pp. 85-87, fig. 1*).—Brief reports of progress are given on the physiology and nutrition of plants under artificial light, including the response of seedlings to various wave bands of low intensity radiation, the influence of short cycles of radiation and continuous radiation of various intensities supplementary to a 9-hr. day on the growth and flowering of certain annual plants, the vernalization of long- and short-day plants by high and low temperatures and light, and the chemical inhibition of micro-organism growth in plant nutrient solutions containing organic nutrients, by R. B. Withrow, T. M. Eastwood, and R. K. Showalter.

Extend use of colchicine as plant breeding tool, M. L. RUTTLE and B. R. NEBEL. (N. Y. State Sta.). (*Natl. Seedsman*, 8 (1941), No. 2, pp. 16, 18, fig. 1).—A brief report of progress in studies of this method.

Measures of respiratory activity with resting cells, R. H. BURRIS and P. W. WILSON. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 721-726).—The authors conclude from a review of the literature and their own work here presented that the $Q_{O_2}(N)$ has much to recommend it as the most suitable measure of respiratory activity. With the Rhizobia, for example, not only does it show the least variation of the measures tested, independent of the composition of the medium used for growth of the cells, but also it rests on a Kjeldahl analysis which is believed to be the easiest and most accurate of the determinations made. As long as respiration of washed cells remains linear with time, assimilation of a portion of the substrate should not seriously interfere with the interpretation of results.

Microtechnique for the shoot apex, E. BALI. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 3, pp. 233-243, figs. 15).

A periclinal division in the "dermatogen" at the tip of the maize growing point, B. C. SHARMAN (*Nature [London]*, 146 (1940), No. 3711, p. 778, figs. 2).—This appears to be the first recorded case of the dermatogen contributing to the inner tissues in angiosperms, though it is well known to occur in the more primitive vascular plants, including the gymnosperms.

Formation of organs in wheat and barley while entering into the light phase, A. A. SAPEHIN [SAPEGIN] (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 8, pp. 754-756, figs. 3).

The influence of the length of the photoperiod on the vegetative and reproductive development of *Rudbeckia bicolor superba*, *Delphinium ajacis*, *Cosmos sulphureus*, and *Impatiens balsamina*, J. P. AUSTIN (*Amer. Jour. Bot.*, 28 (1941), No. 3, pp. 244-250, figs. 12).—The following responses were obtained by subjecting these four plant species to photoperiods of 8-20 hr. under otherwise comparable conditions: Initiation of stem elongation from the leaf rosette of *R. bicolor superba* was both qualitatively and quantitatively influenced, in *D. ajacis* only quantitatively. Stem elongation was greatest under intermediate photoperiods in all four species, the influence being primarily on the internodes. The green and dry weights of the aerial and subterranean parts of *I. balsamina* were maximum under the 16-hr. photoperiod. Root development and the percentage of water in the aerial parts were greater under the longer photoperiods. Initiation of flower buds in *R. bicolor superba* (long day) and *C. sulphureus* (short day) was influenced both qualitatively and quantitatively, but in *D. ajacis* (long day) and *I. balsamina* (short day) the response was only quantitative. Development of flower buds after their initiation was quantitatively hastened in *R. bicolor superba* and retarded in *D. ajacis* by increased photoperiod. In the other two species length of photoperiod had no observable influence on development of the flower bud once it was initiated.

Fotoperiodismo em cafeeiro (*C. arábica* L.) [Photoperiodism in coffee (*Coffea arabica*)], C. M. FRANCO (*Rev. Inst. Café Estado São Paulo*, 15 (1940), No. 164, pp. 1586-1592, figs. 6; *Eng. abs.*, p. 1592).—The experiments recorded appear to indicate that coffee belongs in the short-day group of plants.

Fotoperiodismo del cafeto [Photoperiodism of the coffee plant], C. M. FRANCO (*Rev. Inst. Defenso Café Costa Rica*, 11 (1941), No. 81, pp. 219-222).—The experiments reported appear to place coffee in the group of short-day plants.

Vernalization and photo-periodic induction.—I, **Perennial rye-grass** (*Lolium perenne*), D. CAIRNS (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 2A, pp. 86A-96A, figs. 3).—By vernalization and short-photoperiod technic described, the germinating seeds of ryegrass were treated, the effects on growth, forage yield, maturity, vegetative period, and seed yield are tabulated, and the practical possibilities of the results are discussed. The green-matter yield varied according to the length of treatment, an increase of nearly 64 percent over controls being recorded for one vernalization treatment. The percentage of plants reaching maturity was progressively reduced with increase in length of treatment, and the vegetative period was longer with the short treatments. The green-matter yield was depressed with all photoperiod induction treatments used, and the percentage of plants reaching maturity was reduced with prolongation of treatment.

Diurnal migration of injected radiophosphorus from bean leaves, O. BIDLPH. (Wash. State Col.). (*Amer. Jour. Bot.*, 28 (1941), No. 4, pp. 348-352, figs. 2).—Using a technic for injecting a radioactive isotope (P^{32}) into a bean leaf and a method of "counting" whereby direction and amount of movement from the leaf could be detected (both described), these studies showed that the percentage of P migration and its distribution in the plant varied throughout the day. The initial direction of migration from the leaf was predominantly downward, and during the evening 40 percent of the migratory P reached the root system. The greatest total downward migration was about 10 a. m., with the least about 10 p. m. Upward migration showed a maximum near noon, but the amount was small. Light was in some way associated with migration, but maxima did not exactly coincide. Curves show the migration of phosphate from an injected leaf to upper leaves and stem, lower leaves and stem, and roots for the 24-hr. period. It is concluded that a mechanism exists whereby a daily periodic "circulation" of P occurs within the plant.

Die Assimilation einiger Frühjahrs- und Sommerpflanzen im Verlaufe ihrer Vegetationsperiode [The assimilation of some spring and summer plants in relation to their developmental stages], M. SPANING (*Jahrb. Wiss. Bot.*, 89 (1941), No. 4, pp. 574-614, figs. 20).—This study concerns the metabolism of five spring and five summer plant species. It is shown that the assimilatory capacity of a plant at blooming time is at a distinct minimum, whereas its greatest intensity occurs at the time the blossom buds and fruit are being formed. This rhythm was demonstrated for both spring and summer plants. Transpiration was found to be highest at the time of blooming, when assimilation was at a minimum. Amazingly high transpiration rates per surface unit were attained by stems. The spring plants reacted to light intensity as typical shade plants. On the other hand, such plants as *Sinapis alba* reached their greatest assimilatory capacity under high light intensity. The plants studied grouped themselves into those with short vegetative period and high CO_2 exchange and those with long life cycle and low assimilatory balance. The limited CO_2 uptake at blooming time is probably associated with the protein economy of the cells. At blooming time there is a strong decomposition of the leaf protein which is believed to depend on a substance originating in the blossoms. This decomposition changes the constitution of the cell so that its assimilation is inhibited. A second substance arising later in the fruit neutralizes the previous inhibitory effect, and the cell again assumes its normal relations and metabolism attains another high point. There are 35 literature references.

Protoplasma-wachstum und Stickstoffwanderung in der Koleoptile von Zea mays [Protoplasmic growth and nitrogen migration in the corn coleoptile], F. BLANK and A. FREY-WYSSLING (*Ber. Schweiz. Bot. Gesell.*, 51 (1941), pp. 116-142, figs. 5).—Results of experiments on the cytology and micro-N

analyses of the corn coleoptile are discussed. Cell division and cell elongation of the growing coleoptile were studied by means of paraffin sections, indications being that cell division does not take place in coleoptiles of 26-mm. length and that growth in length is due entirely to cell elongation. Longitudinal growth is at first basipetal, and parenchymatous cells increase not only in length but also in volume. The N content, determined microanalytically, increased steadily in growing coleoptiles but not in proportion to their growth in length. An increase in total N and in coagulating N as well as water-soluble N takes place in each cell layer. Thus the increase in cellular protoplasm, as indicated by cytological studies, can not be ascribed to plasmatic swelling but must be due to an increase in living substance. The quantity of water-soluble N compounds in cells is greater during cellular elongation than that of coagulable N compounds. N compounds move constantly upward in elongating coleoptiles and the auxins migrate downward. Any influence of growth substances on the stream of N compounds is of only secondary nature. At their death, $\frac{1}{4}$ - $\frac{1}{3}$ of the N in coleoptiles is sacrificed. The larger portion of the remaining N is in a coagulable plasmatic form.

The toxic effects of heavy metals on protoplasm, W. SEIFRIZ and M. URAGUCHI (*Amer. Jour. Bot.*, 28 (1941), No. 3, pp. 191-197, figs. 3).—The order of toxicity ascertained for metal cations for the plasmodia of the slime mold *Physarum polycephalum* as measured by stoppage of protoplasmic streaming was Ag>Hg>Cd>Ti>Cu>Pb>Zn>Y>Sr>La>Rb. The toxicities of salts of Fe, Th, and U were found due primarily to the high H-ion concentrations of their solutions. No relation between toxicity and valence or atomic number was found, and only a feeble correspondence with the positions of the metals in a periodic system. Comparison of the order of adsorption of salts of five of these metals by blood charcoal with their toxic order indicated a direct relationship. Curves of the toxicity of Ag, Cd, and Cu salts plotted against concentration, and curves plotted on their respective logarithms closely resembled curves of the adsorption isotherm and its logarithmic plot. From these data it appears probable that adsorption plays the primary and certainly the initial role in the toxic action of heavy metals on protoplasm.

Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition, L. G. WILLIS (*New York: Chilean Nitrate Ed. Bur., Inc., 1941, 3. ed., Sup. 2, pp. 67*).—A second supplement to the third edition (E. S. R., 83, p. 748).

The inhibiting effect of nitrate on chlorate toxicity, A. M. HURD-KARREER (U. S. D. A.). (*Amer. Jour. Bot.*, 28 (1941), No. 3, pp. 197-206, figs. 3).—Crafts' finding (E. S. R., 81, p. 511) that chlorate toxicity to plants varies inversely with the amount of nitrate in nutrient solutions or in soils was confirmed. The effect was less pronounced in acid than in neutral or alkaline soils, and complete inhibition was never attained. In water cultures ammonium N proved without effect on chlorate toxicity, but in a soil test the toxicity was greatly reduced by $(\text{NH}_4)_2\text{SO}_4$, which presumably became effective after nitrification. Variations in concentration of other single ions (K, Ca, Mg, phosphate, and sulfate) in the nutrient solution were without significant effects.

Deistvie fermentov v razlichnykh uchastkakh lista (The action of enzymes in different parts of the leaf), N. SISAKYAN (SYSSAKYAN) and A. KOPYAKOVA (*Biokhimiya*, 6 (1941), No. 1, pp. 50-57, fig. 1; *Eng. abs.*, p. 57).—No uniformity was found in the trend of invertase action in different parts of the sunflower leaf. The synthesizing capacity was most pronounced at the leaf base, weaker at the apex, and very weak in the midportion, whereas in the vascular system the trend was markedly hydrolytic. The extent of variation in syn-

thesizing and hydrolyzing action in different parts of the leaf evidently depends on alterations in this organ and in the whole plant as determined by age. During blooming and at the milk stage of the seed, when the transfer of assimilatory products there is most intense, the rate of the hydrolytic processes in the leaf is increased. On the other hand, the synthetic processes increase at the stage of full ripeness, when the stimuli for depletion of assimilatory products are considerably weakened. The authors stress the importance of taking into account this lack of uniformity in the enzymic activity of different parts of the leaf when pooling representative samples for physiological and biochemical studies.

O namerennom izmenenii napravlennosti deistviya fermentov v zhivoi rastitel'noi kletke (On deliberate alteration of the prevailing direction of enzyme action in living plant cells), N. SISAKYAN (SYSSAKYAN) and A. KOPYAKOVA (*Biokhimiya*, 6 (1941), No. 1, pp. 41-49, fig. 1; *Eng. abs.*, p. 49).—Using chrysanthemum and sunflower plants, removal of the inflorescence at the time of formation of the organs of fructification resulted in a marked shift in the direction of invertase action towards synthesis. Preservation of the inflorescence and reduction of the assimilating surface displaced the invertase action in the direction of hydrolysis. Artificial intensification of the transfer of assimilatory products from the test leaves to the upper growing leaves also favored hydrolysis. It is suggested that the diurnal variations in the trend of enzyme action are determined by the intensity of transfer and by the stimuli causing alterations therein. There appears to be a relationship between the interaction of the different organs of the plant and the trend of enzyme action in the leaves.

Relation of vitamin C to cell size in the growing region of the primary root of cowpea seedlings, M. E. REID. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 28 (1941), No. 5, pp. 410-415).—"Relatively high indophenol-reducing values per unit mass of fresh tissue are associated with nuclear and cell division, intermediate values with elongation, and the lowest value with maturation. On a dry weight mass basis a double gradient in indophenol-reducing activity was observed increasing from both the embryonic and maturation zones toward the region of elongation. Differences in nucleo-cytoplasmic ratio are apparently chiefly responsible for the former gradient and differences in the cellulose-cytoplasmic ratio for the latter. The vitamin C in a root cell continues to gain until elongation ceases and maturation begins. The quantity of water per cell also increases, but much more rapidly than the vitamin C. The relative values for the dry weight of the cell at successive stages of growth approximate the relative vitamin C values much more closely than do those representing the green weight. Values representing the relative surface areas of cells in different stages of development as previously estimated are strikingly similar to those representing the vitamin C."

It is thus suggested that vitamin C may have a functional relationship at the cell surface. If localized there, it may have an important influence upon absorption and retention of the absorbed substances. The evidence suggests that accumulation of ascorbic acid may precede and possibly condition cell expansion. The comparatively slight vitamin C variations in the green weight of plants grown on soils of widely varying fertility as reported by different investigators become understandable if the vitamin has a functional relationship to growth.

The yeasts: Genetics, cytology, variation, classification, and identification, A. T. HENRICI. (Univ. Minn.). (*Bact. Rev.*, 5 (1941), No. 2, pp. 97-179).—This monograph (over six pages of references) takes up the genetics, cytology, variations, and phylogeny of yeasts before proceeding to the classification and detailed discussion of the different types and practical aspects of the group. Keys and technical procedures for identification are included.

Some observations on the fluctuations of moisture content in the sugar cane plant, H. A. WADSWORTH (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 2, pp. 121-130).—Detailed studies of daily or hourly changes in the moisture contents of plant tissue are conspicuously absent from the literature. Brix values within short intervals may be assumed to be closely correlated with the moisture of tissues sampled, but a more direct measure is the actual determination of the content by oven-drying procedures. Determinations by the latter technic here reported for sugarcane were found to support the Brix studies, and the evidence suggests a cyclic action characterized by high moisture content before daybreak and low content in the late afternoon or early evening. There also appeared to be a distinct gradient in moisture content in the top of the cane stick, as if a constant moisture were maintained in the apical meristem, if possible, even if other tissues suffered partial desiccation during the day. Water apparently may be withdrawn from the transpiring surfaces at a rate greater than the rate of supply by the roots even at high soil-moisture contents. It seems that if the soil moisture is readily available, temporary moisture deficiencies within the plant, due to transpiration during the day, are rectified by additions of moisture by the roots during the night. If, however, soil moisture is depleted and no longer available at an adequate rate the plant would, presumably, enter a period of intense transpiration demand at a reduced moisture level, and ultimately it would die. There is little evidence that minor diurnal desiccations entail economic losses of recoverable sugar, nor could the author curtail seriously the economic production of sugar by impressing reasonable periods of soil moisture deficiency on plants grown in carefully controlled tests. More evidence is necessary before these preliminary findings can be applied with any confidence to irrigation control, but certain suggestions are presented.

pH determination in plant tissue, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 405-409).—The author found his method (E. S. R., 85, p. 16) used for soils of low moisture content to be equally applicable to plant tissues. For soils, one of the essentials was the use of a horn spoon in spreading the moisture or soil films uniformly throughout the rather dry soil mass. When plant tissue is finely ground in a grinder, relatively few of the cells are actually opened. The important fact is that the contents of the cut cells are smeared over the uncut groups of cells. The agreement between results obtained with this method and with juice extracted from frozen tissue was most satisfactory. Over a wide pH range in the soil of avocado cultures, no significant change in the pH of the leaf juice was noted.

Physico-chemical studies on the nature of cold resistance in crop plants. (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt. [1940]*, pp. 31-32).—A brief progress report of studies of winter wheat and seedling transplant stock of broadleaf trees.

GENETICS

Recent work on the relation between genes and developmental processes, C. STERN (*Growth Sup., Symposium Develpmt. and Growth*, 1 (1939), pp. 19-36).—"No single concept or even a limited number of them appear adequate for an understanding of genes and developmental phenomena. Nevertheless, the genes are involved in all developmental processes, physiological reactions within the cell, hormone production, dependent and autonomous differentiation."

The chemistry of the chromosomes, A. GULICK. (Univ. Mo.). (*Bot. Rev.*, 7 (1941), No. 9, pp. 433-457, figs. 3).—A critical review, with 130 references.

Genetic studies of heat and drought tolerance in maize, E. G. HEYNE and A. M. BRUNSON. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 803-814, figs. 4).—Studies involving selfed lines of corn

and crosses among them showed heat tolerance (E. S. R., 83, p. 52) to be inherited definitely and, in most cases, intermediate to dominant in behavior. Hybrid vigor, in itself, apparently does not make a cross resistant to heat, at least in the seedling stage. Examination of linkage relations between one or more factors in 8 of the 10 linkage groups and possible factors determining heat tolerance showed close associations of heat tolerance with the *Su₁su₁* and *Prpr* and a possible association with *Cc* loci. Effects of *gl₁* and *gl₂* in the seedling stage appeared to protect the seedlings from injury by artificial heat, while *gl₂* seemed not to have this protective quality. The *su* gene seemed directly responsible for susceptibility to heat injury as was shown by behavior of seedlings from sugary and starchy kernels. The equal distribution of semisterile and normal plants among those tolerant to heat from a backcross involving chromosome 4 supported this view.

Genetics of cross-incompatibility among self-incompatible plants of *Trifolium repens*, S. S. Atwood. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 12, pp. 955-968, figs. 2).—When white clover plants were self-pollinated in several ways and at different times, seed-set was so low that all were deemed practically self-incompatible. The 13 F₁ plants consisting of four intra-sterile, interfertile groups of 5, 4, 3, and 1 plant, respectively, were all reciprocally compatible with both parents. With 10 flowers in each mating, compatible crosses averaged 44.9 seeds and incompatible 0.26. The results were explained by the diploid perisperm type of multiple oppositional allelomorphs, discussed by East and Mangelsdorf (E. S. R., 55, p. 27), where the parents differed in both factors. To check the applicability of this theory to white clover and to establish a certain genotype for each parental and F₁ group, 39 F₂ plants from three F₁ intercrosses were tested by backcrossing to the two parental and four F₁ groups, and only expected groups were obtained. Tests of 37 plants from incompatible crosses and selfs by similar backcrossing showed 11 to be homozygous, 7 heterozygous, and 19 contaminants. Three of four possible homozygous genotypes were among these 11, and the fourth was obtained from an unrelated series. Within 20 to 72 hr. after pollination, crosses on any plant could be predicted as compatible or incompatible by the withering of petals and reflexing of pedicels. The number of seeds set per flower in compatible crosses, a measure of the number of ovules produced, appeared to be inherited. Plants have averaged from 13.8 to 62 seeds per 10 flowers, and these differences in seed set in the greenhouse were correlated significantly in plants tested with the seed set under bee cages in the field.

A colchicine-induced homozygous tomato obtained through doubling clonal haploids, E. H. Newcomer. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 610-612, fig. 1).—Cuttings from cytologically determined haploid plants were rooted and subsequently treated with a 0.4-percent solution of colchicine. The chromosome complements of 2 of the 20 plants treated were doubled to produce normal diploid and homozygous tomatoes.

Growth of excised roots and heterosis in tomato, W. J. Robbins. (*Amer. Jour. Bot.*, 28 (1941), No. 3, pp. 216-225, figs. 2).—In synthetic solutions supplemented with thiamin, thiamin and pyridoxine (vitamin B₆), or thiamin, pyridoxine, and nicotinamide, the excised roots of the F₁ of two inbred lines of tomato grew more rapidly and produced more dry matter than those of either parent. In one passage, in a solution supplemented with thiazole, the roots of one parent (Red Currant tomato) exceeded those of F₁. The roots of one parent (Johannesfeuer) showed a greater response to pyridoxine than those of Red Currant, but the reverse was true for nicotinamide. Growth of Red Currant roots approached that of the hybrid in solutions supplemented with thiamin,

pyridoxine, and nicotinamide. Explanations for these differences are discussed, and the possibility that the effects of inbreeding and of heterosis may be associated with vitaminlike growth substances is briefly presented.

Peach breeding: A Study of inheritance in some cross-bred seedlings, H. L. LANTZ and T. J. MANEY. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 184-186).—Crosses were made between *Amygdalus davidiana*, a species with nonedible fruits, vigorous growth, hardiness of tree, and disease-resistant foliage, but unfortunately tender flower buds, and the cultivated peach. These interspecific hybrids may have value as rootstocks for the peach and may open possibilities for the breeding of a new and hardy race of edible peaches. Little evidence was obtained that real hardiness may be derived by simply crossing standard varieties of peaches. However, certain selections of open-pollinated, third-generation seedlings of Chili were considerably harder in tree and fruit bud than varieties such as Elberta and Hale.

Chromosome number of the beach plum (*Prunus maritima*), W. D. WEEKS. (Mass. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 141).—The beach plum, a native of the sandy soil of Cape Cod and other coastal areas, was found to have 16 diploid or somatic chromosomes. This number, identical with that of *P. americana* and *P. salicina*, suggested the possibilities of improvement by crossing with these species.

Polyploid cassava, induced by colchicine treatment, E. A. GRANER (*Jour. Hered.*, 32 (1941), No. 8, pp. 281-288, figs. 7).

Metaxenia in *Carica papaya* L., J. D. J. HOFMEYER (*So. African Jour. Sci.*, 37 (1941), pp. 130-132).—The author records metaxenia in the gelatinous skin enveloping fresh papaya seeds. A linkage of 32.1 ± 4.5 percent was observed between the genes for gray and black seed and sex. The possible use of color of the fresh seed for controlling the sex ratio of seedlings is suggested.

A spontaneous tetraploid snapdragon, R. BAMFORD and F. B. WINKLER. (Univ. Md.). (*Jour. Hered.*, 32 (1941), No. 8, p. 278, fig. 1).

Chromosome numbers of some species and varieties of *Vaccinium* and related genera, E. H. NEWCOMER. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 468-470).—The chromosome numbers of 13 varieties of *V. corymbosum*, 5 selections of *V. pennsylvanicum*, 5 species of *Vaccinium*, and 3 related genera are given, with data on chromosome behavior at meiotic metaphase. The chromosome number of the variety of *V. atrococcum* used in this study was 24 pairs and not 12, as previously reported. Neither aneuploidy nor any structural chromosome aberrations could be correlated with the varietal differences within species. Chromosome pairing in *V. corymbosum* suggests an autopolyploid origin, and the analysis of hybrids between *V. corymbosum* and other species of the genus indicates a recent common origin.

Galax: The genus and its chromosomes, J. T. BALDWIN, JR. (*Jour. Hered.*, 32 (1941), No. 8, pp. 249-254, figs. 3).

Pathogenicity of aeciospores obtained by selfing and crossing known physiologic races of *Melampsora lini*, H. H. FLOER. (N. Dak. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 31 (1941), No. 9, pp. 852-854).—Physiologic races of the autoecious long-cycle rust *M. lini* were crossed by transferring of pycniospore-containing nectar from a haploid pycnium of one race to a haploid pycnium of another. The F_1 aeciospores of a cross between races 22 and 6, although borne on Ottawa 770 B, a variety susceptible to race 22 but immune to race 6, were incapable of re-infecting this variety. The pathogenicity of the F_1 aeciospores was identical with that of the urediospore culture derived from them. In the hybrids studied, the factors for avirulence proved dominant over those for virulence.

On the physiological nature of hybrid vigour in animals, H. F. KUSHNER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 2, pp. 175-177*).—Crosses showing hybrid vigor in other animals in studies by the same author (*E. S. R., 81, p. 194*) and in rabbits by Alperovich (*E. S. R., 83, p. 611*) had higher blood values than their parent races. In rabbit races the hybrids between Ermine and Flandre and Ermine and White Giant breeds showed hemoglobin values of about 72 percent, whereas the parental breeds had from 60 to 63 percent. Thus there is favored the hypothesis that the cumulative effect of various allelic genes affects normal physiological development.

The coat of wool of the wild ram of the Old World and the problem of hereditary variability of the coat in the domestic sheep, E. I. KARDYMOVICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 2, pp. 178-181, figs. 5*).—Analyses of 64 specimens of wool from hides of 7 breeds of wild *Ovis* showed that there were 2 main types of wool with 4 modifying types. Fineness was but one of the characters of type, and therefore there was much more variation in diameter. On the average, the coat consisted of from 12 to 17 percent guard hairs, with the balance consisting of the underfleece. The variations of type have been responsible for the evolution of wool of domestic breeds.

Influence of certain color mutations on body size in mice, rats, and rabbits, W. E. CASTLE (Univ. Calif.). (*Genetics, 26 (1941), No. 2, pp. 177-191*).—In continued studies of the relation of body size to color mutations in mice (*E. S. R., 76, p. 463*), data are presented indicating that leaden individuals were significantly smaller, whereas browns and yellows were significantly larger, than normals. The effects of certain combinations of the genes and their alleles on body size are compared with the normals. It is shown that A^y produces the greatest increase in body weight when heterozygous. Brown individuals were about 5 percent heavier than normals, except in combination with pink eye or leaden, when there was an equal reduction in weight. The changes in body length and tail length were in the same general direction, but lesser. The brown mutations in the rat and rabbit increased body size. These results were based on measurements of individuals, both heterozygous and homozygous, for the genes concerned.

Inheritance in guinea pigs of the susceptibility to skin sensitization with simple chemical compounds, M. W. CHASE (*Jour. Expt. Med., 73 (1941), No. 6, pp. 711-726, figs. 4*).—Lines of guinea pigs were established which differed significantly in the degree of sensitivity attained to 2,4-dinitrochlorobenzene. On account of the variation within these lines as to the types of sensitivity it was not possible to ascertain the mode of inheritance, but there seemed no question that the condition was heredity.

Genetic and non-genetic factors which influence the type of the skeleton in an inbred strain of mice, E. L. GREEN (*Genetics, 26 (1941), No. 2, pp. 192-222, fig. 1*).—An analysis by variance of differences of skeletal types among 3,026 individuals of the Bagg albino strain showed that from 9 to 10.5 percent of the total variability in the position of the sacrum was caused by sex factors. Approximately the same amount of variability was common to litters, whereas other nongenetic factors control from 80 to 83 percent of the variance. Differences in the ribs were controlled in about the same relative magnitude, thus the largest portion of the total variation is caused by local action of non-genetic factors within individuals. Further than that, about one-fourth to one-third of these factors act on single sides independently of other agents. Age of the mother or some complex of factors associated was responsible for not more than nine-tenths of the resemblance of litter mates. The

sexes differed in the formation of the vertebrae so that ♂s had 13 ribs about twice as frequently and 27 presacral vertebrae about half as frequently as ♀s. A summary is included of vertebral variations found in 10 other inbred lines of mice.

The influence of age and rate of breeding upon the ability of the female rat to reproduce and raise young, S. A. ASDELL, R. BOGART, and G. SPERLING ([*New York*] *Cornell Sta. Mem.* 238 (1941), pp. 26, figs. 8).—A more complete account is given of the investigation previously noted (E. S. R., 84, p. 31).

Frequent failure of a single insemination to activate the corpora lutea of the rat sufficiently for implantation of fertilized ova, J. BALL (*Amer. Jour. Physiol.*, 130 (1940), No. 3, pp. 471-474).—In approximately one-third of 109 ♀ rats allowed a single mating, the usual oestrous smears occurred from 4 to 5 days thereafter, and normally developing fertilized ova were found in the uteri of four such animals autopsied 4 days after mating. Pregnancy ensued when three vaginal plugs were found, even though these were produced in part by vasectomized ♂s. It is thus concluded that more than one plug is needed to set up the chain of events normally leading to implantation. However, a small group of rats of an albino strain responded to the stimulus of one plug much more readily than the hooded animals.

Variations in the yield of gonadotropic material from green plants in relation to the season of growth and the pH of the fresh juice, M. H. FRIEDMAN and J. W. MITCHELL. (U. S. D. A.). (*Endocrinology*, 29 (1941), No. 2, pp. 172-178, fig. 1).—The gonadotropic potency of the juices of plants of feterita, corn, kidney beans, Amber sorghum, Sudan grass, German millet, rape, soybeans, and alfalfa showed seasonal variation. Ovulation in the post partum rabbit was induced only with two samples of corn and one each of feterita and Sudan grass grown in June and July. The pH of the inactive samples which were grown in the intervening months was about 5.4. The juices were mostly of low potency, but one was comparable to late pregnancy urine.

Effect of method of desiccation and storage on the gonadotropic activity of the pituitary gland, H. S. KUPPERMAN, W. H. ELDER, and R. K. MEYER. (Univ. Wis.). (*Endocrinology*, 29 (1941), No. 1, pp. 23-26).—Comparative gonadotropic activity of pituitary glands from rats, chickens, sheep, and cattle preserved and dried showed that desiccation by air-drying between two glass plates and freezing and storage of the fresh gland for 35 days caused no significant loss in activity. Losses in potency followed acetone and alcohol drying and storage of the frozen gland from rats and chickens for 80 days. The assays of the gland tissues were made by ascertaining the ovarian weights of immature ♀ rats after 4.5 days following twice-daily treatment.

Growth of the Graafian follicle and the time of ovulation in the albino rat, J. L. BOLING, R. J. BLANDAU, A. L. SODERWALL, and W. C. YOUNG (*Anat. Rec.*, 79 (1941), No. 3, pp. 313-331, pls. 2, fig. 1).—From a study of follicular growth in ♀ rats it was found that Graafian follicles destined to rupture begin their development about the time of heat, but their growth is terminated toward the end of the next heat period. Ovulation was usually complete 10 hr. after the beginning of oestrus. In the follicles which do not mature, atretic changes were noted about the third day of the cycle. In conducting these studies there were used 37 adult ♀ rats for investigation of the development of the follicles and 118 for the relations between ovulation and heat.

Absorption of pellets of crystalline testosterone, testosterone propionate, methyl testosterone, progesterone, desoxycorticosterone, and stilbestrol implanted in the rat, T. R. FORBES (*Endocrinology*, 29 (1941), No. 1, pp. 70-76, figs. 6).—The rate of absorption of the pellets weighing from 6 to 10 mg. each

varied with the substance implanted, but were independent of sex. Ninety percent of the pellets were absorbed in from 27 to 88 days. The apparatus for preparing the uniformly compressed tablets is described.

Gonadotropic antagonism in mature rats, F. BISCHOFF and G. J. CLARKE (*Endocrinology*, 29 (1941), No. 1, p. 163).—The daily administration of pituitary gonadotropic hormones subcutaneously for 4 days to adult ♀ rats caused no change in body and ovarian weights, although uterine weight was reduced. When Cu was added to the hormone to delay resorption, ovarian weight was practically doubled and uterine weight was materially increased.

The inactivation of estradiol and estradiol benzoate in castrate female rats, G. R. BISKIND. (Univ. Calif.). (*Endocrinology*, 28 (1941), No. 6, pp. 894-896).—The implantation of pellets of oestradiol or oestradiol benzoate subcutaneously into castrated ♀ rats induced constant oestrus, but when implantation was in the spleen in normal position there was an immediate short period of oestrus followed by anoestrus. Transplantation of the spleen with oestradiol pellets so that the blood supply entered directly into the systemic circulation allowed the specific action of oestrogen. The inactivation was thought to result from the circulation going through the liver. These studies were made on 28 castrate ♀ rats in anoestrus.

Inactivation of testosterone propionate by normal female rats, G. R. BISKIND (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 452-453).—The power of testosterone propionate implanted in adult ♀ rats to inhibit normal oestrous cycles was destroyed in pellets implanted in the spleen. Anoestrus occurred as long as the pellets were implanted under the skin or in the blood stream without passing through the liver. It thus appears that the liver is the point of inactivation of testosterone, as in the case of oestrogen.

Effect of testosterone propionate upon reproduction in the female, J. W. HUFFMAN (*Endocrinology*, 29 (1941), No. 1, pp. 77-79).—When 19 healthy adult ♀ rats were injected daily with 2 mg. of testosterone propionate, oestrogenic activity decreased, and all were in dioestrus within 5 days and so remained as long as injections were continued. There was no mating with normal ♂s. Normal oestrus occurred after the injections were discontinued, and normal litters were produced.

The reproductive organs in malnutrition: Effects of chorionic gonadotropin upon atrophic genitalia of underfed male rats, M. G. MULINOS and L. POMERANTZ (*Endocrinology*, 29 (1941), No. 2, pp. 267-275, figs. 5).—The regressive changes of the testes of rats on a submaintenance ration were prevented by the injection of chorionic gonadotropin. Doses of from 10 to 25 rat units were equally effective, but to restore spermatogenesis it was necessary to continue the dose for 40 days. It was concluded that the atrophy of the genital organs and the consequent sterility in the chronically underfed ♂ rat was due to an insufficiency of the gonadotropic hormones from a depression in the growth of the pituitary gland.

Will anterior pituitary-like substance prevent the degenerative changes in the testis incident to cryptorchidism? C. E. REA. (Univ. Minn.). (*Endocrinology*, 29 (1941), No. 2, pp. 288-289).—Degeneration of the testicle following artificial cryptorchidism in rats and guinea pigs was not prevented by the administration of anterior-pituitary-like hormone or testosterone.

Effects of large amounts of androgen on the testes of the prepuberal rat, R. R. GREENE and M. W. BURRILL (*Endocrinology*, 29 (1941), No. 1, pp. 64-69).—Treatment of immature ♂ rats over a 20-day period with total doses of from 25 to 140 mg. of testosterone neither stimulated nor depressed the testis weight.

However, small doses, such as were derived by untreated controls in the same cages with treated rats, showed reduction in the testis weight as compared with untreated rats in separate cages. This brings out differences in the effect of small doses obtained by contact as compared with larger doses supplied by injection.

Occurrence of ovarian "tumors" in spontaneous virilism of the hen, H. B. FRIEDGOOD and U. U. UOTILA (*Endocrinology*, 29 (1941), No. 1, pp. 47-58, figs. 9).—The weights and histology of the ovaries, thyroids, pituitaries, and adrenal glands of five pullet and yearling hens which showed masculinization characteristics of comb, spurs, etc., are described in comparison with normal hens. These birds showed complete destruction and atrophy of the left ovaries.

Effect of light on sexual maturation, estrous cycles, and anterior pituitary of the rat, V. M. FISKE (*Endocrinology*, 29 (1941), No. 2, pp. 187-196).—Continuous lighting caused a greater production of FSH (follicle-stimulating hormone) than did darkness in rats, whereas increased darkness favored LH (luteinizing hormone) secretion. Female rats kept under all-day illumination from birth reached sexual maturity 6 days earlier than those kept in the laboratory and 16 days earlier than rats kept continuously in the dark. It is concluded that light stimulates FSH production, and other evidence bore this out, whereas LH production in the dark seemed evident. Light on 77-day-old castrates caused increased stimulation of both FSH and LH. The pituitaries, ovaries, and uteri of ♀s and pituitaries, testes, and seminal vesicles of ♂s kept in the light were larger than these organs in animals kept in darkness.

The site of elaboration of the pituitary gonadotropic hormone and of prolactin, M. H. FRIEDMAN and S. R. HALL. (U. S. D. A.). (*Endocrinology*, 29 (1941), No. 2, pp. 179-186, fig. 1).—Assays of extracts of the pituitaries from 123 steers and 25 cows showed that the medulla was much higher in its concentration of gonadotropic hormone than the cortex, while the reverse was true for prolactin. The independence of the production of the two hormones was emphasized in the rabbit following coitus, when the gonadotropic content was nearly exhausted, without change in the prolactin content of the extract. The augmentative effect of beef muscle on prolactin makes it difficult to determine the properties of crude and inert extracts. The basophiles of the medulla and the eosinophiles of the cortex were so much interwoven as to make it impossible to ascertain which type of cell produces each hormone.

"Mammogen" and the treatment of spayed hypophysectomized rats with lipid extracts of cattle pituitary, R. O. GREEP and H. E. STAVELY (*Endocrinology*, 29 (1941), No. 1, pp. 18-22, figs. 7).—Extracts of dried ♀ cattle pituitaries injected into 21-day-old spayed hypophysectomized rats for 6 days caused unquestionable mammary growth. The response to extracts from 25 mg. equivalent of fresh tissue was slight but definite. Increased effects were noted from larger doses, but the maximum occurred with 100 mg. of the tissue extract. The waxy lipid fraction did not produce any mammary stimulation when representing as much as 400 mg. of fresh gland. There was some loss in potency during the extraction process. Mammary stimulation and body growth produced by the extract were associated but not always correlated as to amount.

Does pregnancy suppress the lactogenic hormone of the pituitary, C. W. TURNER and J. MEITES. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 2, pp. 165-171).—Evidence is presented to show that lactation is intimately associated with lactogen secretion of the pituitary and that lactation is not inhibited by pregnancy or the condition of the ovaries. The lactogen content of the pituitaries removed from rabbits on the twentieth day post partum was practically

the same from rabbits that were simultaneously pregnant and lactating as from nonpregnant does. During pregnancy without lactation, the content of the hormone in the pituitaries remained low, but following parturition it increased from 2 to 4 times. The lactogen content of the pituitaries of pregnant animals was not significantly altered by ovariectomy. The placentas of three pregnant-lactating animals were shown to contain lactogenic hormone.

The effect of thyroxin on growth, oxygen consumption, and body composition of hereditary dwarf mice, E. G. BOETTIGER. (Univ. Md. et al.). (*Endocrinology*, 28 (1941), No. 5, pp. 785-792, figs. 2).—During the first week of life, O₂ consumption of dwarf mice is practically equal to that of normals. Beginning with the second week, metabolism of the normal nearly doubles, but the O₂ consumption of the dwarf was found to be from 30 to 40 percent lower. The O₂ consumption and growth of dwarf mice were equal to normals when the environmental temperature was raised to 33° C. or when 8γ of thyroxine were administered per day. It appears that faulty growth and metabolism of dwarf mice result from an atrophic thyroid. Dwarf mice have a higher fat content throughout life than normals.

FIELD CROPS

[**Field crops research in Connecticut**] (*Connecticut [New Haven] Sta. Bul.* 446 (1941), pp. 419-421, 424, 427, 430-433).—Brief reports are made again (E. S. R., 84, p. 463) from tobacco research at Windsor (E. S. R., 85, p. 759) including development of improved types of shade tobacco, fertilizer placement, spacing tests, studies of chemical composition of leaves, fermentation, relation of Ca to growth and quality, and black tobacco; breeding work with corn concerned with growth changes resulting from chromosome loss and rearrangement in developing tissues, improvement by selection in backcrossed lines, gametic lethals, small pollen *sp.* and lethal ovule *lo₁*, a maternally inherited white seedling, and a variegated corn plant induced by treating pollen with ultraviolet light; potato rotations; and effects of a pregermination chilling treatment of beet and chard seed on germination.

[**Farm crops research in Indiana**]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1940*, pp. 28-29, 29-32, 33, 34, 40, fig. 1).—Further investigations with field crops (E. S. R., 84, p. 178) reported on briefly by G. P. Walker, R. R. Mulvey, W. W. Worzella, G. H. Cutler, A. H. Probst, S. R. Miles, M. Drake, G. D. Scarseth, C. E. Skiver, and A. M. Brunson included variety tests with corn and hybrids and wheat; breeding work with corn and hybrids, wheat, and soybeans; merits of different combinations of the same four inbreds for making hybrid corn; fertilizer experiments with corn, wheat, and sugar beets; quality of tobacco affected by balance of K, Mg, and Ca nutrients; factors affecting winter hardiness, yielding ability, and milling and baking qualities of wheat; a study of maturity of seed corn; adaptation of Atlas sorgo as a silage crop in central and southern Indiana; value of sweetclover as an intercrop in a rotation of corn and oats; and adaptation of Marietta, a new early strain of timothy, for use in an alfalfa-timothy mixture.

[**Field crops work at the Northeast Louisiana Station, 1939-40**] (*Louisiana Sta., Northeast Louisiana Sta. Bien. Rpt. 1939-40*, pp. 4-23).—Crops experiments (E. S. R., 81, p. 363) reported on by C. B. Haddon and J. A. Hendrix comprised variety trials with cotton, corn and hybrids, oats, alfalfa, lespedeza, soybeans and edible soybeans, and winter legumes; effect of cotton variety on grade of lint; spacing tests with cotton and corn; effects of clipping (simulating winter grazing) on oats, barley, and rye; fertilizer experiments comprising

formulas, N sources before planting and side dressing, rates for sodium nitrate, yields after corn and soybeans, production after different winter legumes, and after vetch seeded at different rates and turned under on several dates, and after N carriers as supplement to vetch—both primary and residual effects—all with cotton; and N sources for side dressing corn, and for oats.

[**Farm crops research in Mississippi**] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), Nos. 6, pp. 1, 2, 6, 7; 7, pp. 1, 3-6, 8, figs. 5; 8, pp. 1, 2, 3-8, figs. 7).—Findings of interest in current agronomic experimentation are reported in the following articles:

No. 6.—Side-Dressing Cotton Means Added Profits, by W. B. Andrews (pp. 1, 2); Control Weeds With Minimum Injury to Plants—Two Ideals of Cotton Cultivation, by I. E. Hamblin (p. 6); and Soil Fertility Experiments With Cotton—Hemphill Field in the Central East Delta, by R. Kuykendall (p. 7).

No. 7.—Pastures in Mississippi—A Preliminary Report, Part 1, by H. W. Bennett (pp. 1, 3-6); and Oats Variety Test, Rates and Dates of Seeding, 1941, by P. W. Gull (p. 8).

No. 8.—Cutting Time, Field Method, Fix Hay Grade, by I. E. Hamblin (pp. 1, 7); Oat Yield Increased 10 Bushels Per Acre by Legumes, by C. D. Hoover (pp. 1, 2); Plant Color, a Key to Nutrient Needs of Growing Crops, by R. Cowart (p. 1); Pastures in Mississippi—A Preliminary Report, Part 2, by H. W. Bennett (pp. 3-6); Varieties of Oats, Wheat, Barley, for Hills and Delta—Wheat and Barley Variety Tests, 1941, by P. W. Gull (p. 7), and Small Grain Varieties, 1940 and 1941, by J. F. O'Kelly (p. 7); and Dolomite Proves of Value for Cotton on Brown Loam Soils, by J. Pitner (p. 8).

[**Field crops experiments in Nebraska**]. (Partly coop. U. S. D. A. et al.). (*Nebraska Sta. Rpt. [1940]*, pp. 9-22, 23-25, 32-33, 63-65, 68-70, figs. 3).—Research with field crops (E. S. R., 83, p. 759) reported on from the station and substations comprised variety tests with winter and spring wheat, corn and hybrids, oats, barley, flax, grain sorghums, sorgo, alfalfa, sweetclover, brome-grass, soybeans, potatoes, and castor-beans; trials of artichokes, safflower, and pyrethrum; breeding work with corn (and hybrids), sorghum, wheat, oats, barley, alfalfa, sweetclover, brome-grass, and potatoes; crop rotations; response of corn, wheat, sorghum, and potatoes to fallow and other tillage practices; the influence of manure, alfalfa, pastured sweetclover, and phosphate on yields of sugar beets, potatoes, and other irrigated crops; heat and drought endurance studies with potatoes; effect of different humidity and temperature at various periods of the year in relation to water loss, rotting, and initiation of sprouting of potatoes; light duration and intensity in the production of potato seed; prevention of cracking of Triumph potatoes; comparison of various commercial size-and-shape of seed grades of three different corn hybrids; merits of fanning-mill grading of small grain seed; planting tests with wheat, sorghum, and sweet-clover; inoculation tests with soybeans; studies of seed setting in alfalfa; clipping and palatability tests and coumarin determination with sweetclover; cold resistance of wheat and barley as affected by different factors; improvement of permanent pastures and meadows by improvement of species for reseeding, methods of establishing stands of adapted native and introduced grasses, a test comparing several native grasses and brome-grass as to palatability for sheep, tests of forage grasses and legumes, response of grasses to intensity of clipping, and range studies in sand hill and hard land areas; and control of bindweed by cultivation, smother crops, burning, rotations, and sodium chlorate and other chemicals.

[**Field crops research in North Carolina, 1939-40**]. (Partly coop. U. S. D. A. et al.). (*North Carolina Sta. [Bien.] Rpt. 1939-40*, pp. 11, 12, 12-15, 16-21,

22-26, 28-29, 38-40, 56-57, figs. 3).—Experiments with field crops and related agronomic activities (E. S. R., 82, p. 37) reported on from the station and substations included variety tests with cotton, corn and hybrids, barley, wheat, oats, soybeans, peanuts, and potatoes; breeding work with cotton, corn and hybrids, wheat, oats, barley, and peanuts; breeding better cotton by changing the number of chromosomes; shattering among soybean varieties; effects of certain fertilizers—dolomitic limestone, gypsum, Fe, Mn, B, Cu, and Zn—on yields of peanuts; tobacco fertilizer, spacing and topping, and curing investigations; fertilizer experiments with cotton, corn, potatoes, and sweetpotatoes, including placement studies with cotton and corn; cotton fiber research dealing with relation of arrangement of cellulose within the fiber on strength of fiber and its modification by environment, growing conditions, and relation of variety and season to fiber and yarn properties; effect on stands of treating cottonseed with organic mercury dusts; effects of crop rotations variously fertilized and limed on yields of corn and wheat; crotalaria-corn rotations; and pasture and forage studies concerned with response of pastures to lime, phosphate, and controlled grazing, effects of lespedeza, season, and fertilizers on botanical and chemical composition of herbage, and defoliation tests on soybeans simulating different intensities of grazing.

[Field crops experiments by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt. 1940*, pp. 24, 26, 27-30, 41-42, 43-45, 52-53, fig. 1).—Field crops work (E. S. R., 83, p. 617) reported on by A. Rodríguez Benítez, P. Richardson, F. Méndez, F. Chardón, B. Capó, C. J. Clavell, A. Roque, J. Pastor Rodríguez, E. Molinary Salés, G. A. Lebedeff, L. A. Serrano, A. Riollano, and F. J. Juliá from the station and the Isabela Substation, for which brief reports are given, included variety, irrigation, fertilizer, trash disposal, and green manuring (*Crotalaria striata*) tests, and comparison of media for seed germination, all with sugarcane; forage production of fertilized grasses; a staking test with yams and a planting test with peanuts; extraction of fiber from banana stems; fertilizer tests with corn, alfalfa, plantains, and cassava; breeding work with corn, cotton, beans, and sugarcane; and variety tests with sweetpotatoes, yautia, cassava, yam, and peanuts.

The use of forage-acre requirements in range surveys, R. R. HUMPHREY. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 754-760).—Data obtained in taking inventory of grazing resources of a range have only limited value without a knowledge of the number of forage acres required to graze an animal unit for a given period. The main factors which affect forage-acre requirements are amount of unmeasured forage present; differences in nutrient value of different types of forage; condition of range; variations in density and composition estimates made by different survey parties; differences in elevation, exposure, and precipitation; differences in slope; variations in forage-production potentials of different soils; erodibility of soils; grazing practices; and uniformity of forage utilization.

Pastures in Mississippi, H. W. BENNETT (*Mississippi Sta. Bul. 356* (1941), pp. 39, figs. 16).—Practical information on pastures, derived extensively from research in progress at the station, deals with the selection and preparation of pasture land; the values of and ways to establish Dallis, Bermuda, and carpet grasses, white, hop, Persian and Lappa clover, lespedeza, black medic, and Alyceclover; pasture improvement by mowing for weed control and fertilization; temporary pastures; and grazing management. The pasture mixture recommended for State-wide use includes Dallis and Bermuda grasses, white clover, and common lespedeza with certain changes for variations in soil fertility, soil moisture, and seed price. Practices favored include the establishment of all

plant types before use and light grazing in the first season; timely mowing; prevention of overgrazing established pasture by use of supplemental crops; and return of animal manures. Fertilization should be for the benefit of pasture legumes, and for Brown loam soil and prairie regions is best done by application of 200 to 400 lb. of superphosphate or 500 to 800 lb. of basic slag per acre annually; for the infertile soils of the Coastal Plains this mixture may include 100 lb. of potash. From 0.25 to 0.5 ton of limestone should be applied every fifth year.

Effect of level terraces on yield and quality of pasturage and water conservation, H. R. BENFORD and D. G. STURKIE. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 761-767, figs. 5).—Level terraces were not effective in increasing yields or quality of pasture on upland Norfolk sandy soil of low fertility, 1938-39, although they did reduce the run-off about 50 percent and therefore were desirable for conservation.

Legumes for erosion control and wildlife, E. H. GRAHAM (*U. S. Dept. Agr., Misc. Pub. 412* (1941), pp. II+153, pls. 29).—Description, growth habits, uses, and ranges are given briefly for about 400 species of legumes of value in erosion control and for wildlife, or otherwise of significance to conservationists. General information is also provided on uses of legumes, their merits for bees, erosion control, and wildlife; cultural practices for establishment and maintenance; and distribution. Lists of animals and the legumes they use and of common names of legumes are appended. The bibliography includes 223 references.

Effect of different lime levels on the growth and composition of some legumes, H. B. VANDERFORD. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 789-793, figs. 3).—Soybeans, sweetclover, and Korean lespedeza gave increases of 20, 140, and 200 percent, respectively, in forage yield when grown on Grenada silt loam low in exchangeable bases, treated with CaCO_3 so that 25, 50, 75, and 100 percent of the titratable H was neutralized. The Ca and N removed by the crops from the soil rose with each increment of CaCO_3 , while the reverse held for P except in lespedeza. Korean lespedeza gave greater responses to Ca and seemed more efficient in absorption of nutrients than the other two crops.

The effect of having rows different distances apart in rod row plot tests of wheat, oats, and barley, J. B. HARRINGTON (*Sci. Agr.*, 21 (1941), No. 10, pp. 589-606, figs. 5).—Studies involving two highly contrasted varieties of each grain, 1936-39, demonstrated that rod-row plats consisting of single rows 18 in. apart (EE test) did not exactly substitute for the usual rod-row plats with several rows 6 or 12 in. apart, but was a satisfactory comparative rod-row test of cereal lines and because of distinct advantages may be a valuable aid to the breeder.

Boron deficiency of alfalfa in western Washington, K. BAUR, G. A. HUBER, and L. C. WHEETING. (Coop. West. Wash. Expt. Sta.). (*Washington Sta. Bul. 396* (1941), pp. 16, figs. 5).—Surveys, 1937-40, revealed that B deficiency (alfalfa yellows), manifested as a yellowing and reddening of alfalfa leaves and severely dwarfed plants rarely forming flowers, occurs in a large part of the 16,000 acres of the crop in western Washington. Soil types on which the lack of B was observed oftenest were mainly in upland areas. Barnyard manure alone did not make enough B available to eliminate the deficiency entirely, and poultry manure while stimulating alfalfa growth often accentuated the symptoms. Field trials and pot cultures showed that B deficiency might be corrected by applying 50 to 60 lb. of borax per acre to silt and clay loams and 30 to 40 lb. on the lighter soils, as loams, sandy loams, and sands. Responses could be

expected from fall or spring applications providing material became dissolved and mixed with the soil. B as borax should be applied preferably in the fall in nonirrigated sections with low spring rainfall and before spring growth starts in other areas of western Washington. Borax may be mixed with commercial fertilizer or inert materials, such as sand or soil, to increase the volume before application, or applied without mixing with a cyclone or a modified wheelbarrow grass seeder.

Calamagrostis epigeios in Wisconsin, F. V. BURCALOW. (Univ. Wis.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 85-86).—*C. epigeios*, an aggressive grass originally from northeastern Asia, described as able to compete with quackgrass in orchard and garden, has not encroached upon a heavy bluegrass sod. It is used for pasture and seems quite palatable if grazed at early growth stages, but its spread is greatly retarded by close grazing. It has been eradicated successfully with sodium chlorate.

Factors influencing the germination of seed of *Trifolium repens*, G. W. BURTON. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 731-738).—A strain of white clover producing seed 20 to 30 percent of which will germinate early in the fall from natural reseedings may prove valuable in Florida and south Georgia. To determine the presence of such strains in breeding material at Tifton, Ga., seed was harvested from 93 plants, the strain-building progeny of 17 selections, in June 1939. Two mo. after harvest, unscarified seed of the 93 selections, held in germinators at 30°, 20°, and 10° C. for 28 days, germinated averages of 3.1, 3.6, and 64.3 percent, respectively, and when scarified 70.7, 89.9, and 95.3 percent. Storage for 5 mo. at 5° to 15° and at high relative humidities increased appreciably the germination at 20° and 30° of unscarified seed of the four selections tested. Significant strain differences were noted in response to cold storage, scarification, and temperature increase. Increase in temperature hastened water absorption and germination but had little effect upon total germination. Scarification increased the rates of water absorption and of germination, and total germination in all four strains tested, its favorable effects being most pronounced with germination at high temperature levels. Indications were that germination of white clover seed is associated with ability to absorb water. Two selections responding very differently to cold storage did not differ much in seed coat thickness, in pH of seed coat and cotyledon, or in percentage germination of red and yellow seeds, although the selection least affected by cold storage had the smaller seeds.

The use of punched card equipment in predicting the performance of corn double crosses, A. MILLANG and G. F. SPRAGUE. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 815-816).—The method of predicting double-cross performance, employing punched card equipment, was found satisfactory and much faster than hand tabulation.

The Minnesota method of seed increase and seed registration for hybrid corn, C. BORGESON and H. K. HAYES. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 70-74).—The various methods of increase of seed of hybrid corn tried in Minnesota are reviewed, and the plan in current use is outlined.

Minhybrid corn varieties for Minnesota, H. K. HAYES, R. P. MURPHY, E. H. RINKE, and C. BORGESON (*Minnesota Sta. Bul.* 354 (1941), pp. 40, figs. 20).—The breeding, characters, and performance in extensive trials, 1936-40, of 14 Minhybrids released by the station in 1940 and 1941 are described. The new Minhybrids have been classified in maturity groups, at least one being adapted to each of the five corn maturity zones of Minnesota. These include the very early group, Minhybrid 800, northern zone, 82 to 88 days; early, Minhybrids 700, 701,

and 702, north central zone, 89 to 95 days; medium early, Minhybrids 600, 601, 602, 603, and 604, central zone, 96 to 102 days; medium, Minhybrids 500, 501, and 502, south central zone, 103 to 109 days; and the late group, Minhybrids 404 and 405, southern zone, 110 to 116 days. These hybrids have yellow endosperm and excel in yielding ability, plant and ear type, and in resistance to lodging and disease. Seed of the single crosses used as parents of Minhybrids is released only by the station and increased in cooperation with the Minnesota Crop Improvement Association, and is sold only to association members who produce commercial seed of the double crosses.

Relation of environmental factors to cotton fiber length, O. M. SHIPLEY (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 22 (1941), pp. 12*).—Annotated references to books, pamphlets, and periodical articles in English published 1915–40 on effects of environment, i. e., fertilizers, soils, and weather conditions, on the length of cotton lint total 49.

Soil fertility studies with peanuts, E. R. COLLINS and H. D. MORRIS (*North Carolina Sta. Bul. 330 (1941), pp. 23, figs. 2*).—Recent fertilizer and amendment experiments with peanuts, 1938–40, on outlying fields on several soil types (E. S. R., 82, p. 766) are reported, together with data from earlier investigations conducted by H. B. Mann et al. Fertilizer recommendations for peanuts on different soils are included.

Use of 400 lb. per acre of dolomitic limestone in the row at planting gave best results when yield and quality of peanuts, net profit per acre, and percentage of farms showing a profit were considered. Gypsum on foliage at blooming resulted in a few outstanding yields, excelling the use of limestone in average yield and profit. A 1-ton crop of peanuts, with a 2-ton crop of hay, according to chemical analyses removes mineral nutrients equivalent to 300 lb. of an 0–8–34 fertilizer, indicating the K-depleting nature of the crop. K applied alone increased average yields and profits, but the results showed that K should not be used without Ca because of decreases in shelling percentages and the tendency for fewer tests to be profitable when Ca is omitted. Ca and K in combinations gave higher yields of good peanuts, showed a fair profit, and replaced part of the K removed by peanuts. Dolomitic limestone in the row at planting, followed by a side dressing of KCl, was the most economical way of applying these materials. Superphosphate, 150 lb. per acre, gave increased yields but 450 lb. resulted in lower production. At the acre rate of 200 lb., 0–12–6, 0–8–16, or 3–12–6 mixed fertilizers gave increased average yields and profits in about half of the tests. N in mixed fertilizer tended to lower shelling percentage. Mixed fertilizers and limestone or gypsum in combinations sometimes increased yields but, due to extra costs often decreased the net profits per acre. There was little evidence that minor elements are limiting factors in peanut production.

The influence of waxing seed potatoes on loss of weight, yield, and starch content, G. B. DURHAM, R. S. SHAW, and E. P. CHRISTOPHER. (R. I. State Col.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 257–259*).—When three varieties of potatoes were treated with two kinds of wax and stored in a cellar at 42° F., considerable differences in yield were obtained among varieties and also with waxes and monthly (November 21–April 22) treatment dates. There was a greater tendency for midwinter applications to depress yield. Tubers treated with either wax contained about twice as many starch plastids as the check tubers, and the starch grains were large and evenly distributed throughout the cell. On the basis of limited data, waxing as a means of increasing yield of potatoes was not advised.

Potato quality.—III, Relation of soil reaction, irrigation, and mineral nutrition to cooking quality, O. SMITH and L. B. NASH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 507-512).—Additional studies in this series (E. S. R., 83, p. 767) demonstrated that the average specific gravity and degree of meanness increase in potato tubers when the reaction of the soil of pH 4.88 to 5.30 rises to pH 6.73 to 7.19, and decrease slightly at pH 7.26 to 7.55. Least blackening of cooked potatoes occurred at the higher pH ranges. In general, the specific gravity and dry weight percentage of tubers decreased as applications of 4-8-8 fertilizer rose from 1,000 to 3,000 lb. per acre, these determinations being lower in irrigated tubers at each rate than in those not irrigated. Irrigated tubers were less mealy than nonirrigated tubers at the higher rates. An increase in the degree of blackening of tubers usually occurred as the fertilizer rate increased. When eight combinations of N-P-K were applied in the row at planting time, tubers from plants receiving heaviest K and N applications had lower specific gravity, dry weight percentage, and texture ratings than those receiving least K and N. No blackening occurred in tubers of any treatment.

Immature tubers had a lower specific gravity than mature tubers receiving the same fertilizer treatment. With the same cations chlorides produced tubers of lower specific gravity than sulfates. CaCl_2 applications produced tubers of higher specific gravity than applications of KCl.

Interference of ammonia, released from sugar beet seed balls, with laboratory germination tests, M. STOUT and B. TOLMAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 65-69, fig. 1).—Some lots of sugar beet seed contain substances which are toxic to the germinating seed, e. g. free ammonia hydrolyzed from the organic N compounds of the seed ball during germination (E. S. R., 85, p. 188). These toxic substances may be removed from the seed balls by presoaking or thorough washing. Tests in field and greenhouse showed that they had no effects on stands of sugar beets or yields and sucrose content.

Varietal differences of sugar cane in growth, yields, and tolerance to nutrient deficiencies, J. P. MARTIN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 2, pp. 79-91, figs. 5).—When the H 109, 31-2806; 32-1063, and 32-8560 sugarcane varieties were grown in a complete nutrient solution and in solutions lacking each of N, P, K, Ca, Mg, S, Fe, Mn, and B, normal growth and cane and sugar yields of each sort were depressed when any one of these elements was omitted from the solution. Typical deficiency symptoms for each element developed on all varieties, but some varieties showed a much higher degree of tolerance to certain deficiencies than others. The quality of juice of all canes was affected definitely when certain elements were omitted from the nutrient solution, and the effects were more marked on some varieties than on others. Varieties appeared to have different nutritional requirements. The juice quality of a variety under field conditions evidently may be improved in specific areas by applying certain elements to the soil.

Further studies in nitrogen nutrition: Time-of-application-of-nitrogen test, A. H. CORNELISON and H. F. COOPER (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 3, pp. 155-178, figs. 29).—In the second series of this study (E. S. R., 84, p. 615), sugarcane received uniform applications of P and K, with 400 lb. of N per acre in ten 40-lb. units 2 mo. apart, and 250 lb. in ten 25-lb. units 2 mo. apart, or in one application at 1.5 mo., or in three applications—50 lb. at 1.5 mo., 125 lb. at 3 mo., and 75 lb. at 10 mo. Data are recorded on total and rates of elongation; stand; composition of crop; cane yield; contents of water, sucrose, and glucose; and quality, electrical conductivity, and pH of juice.

Under differential N applications, the quantitative responses in H 109 cane and expected sugar yields have become evident only when the average of day and night temperatures exceeds a minimum of 67° F. Timing of applications of N evidently is governed by the plant's capacity to take up and hold in reserve N supplies for use in subsequent tissue formation, ability of soil micro-organisms and colloid complex to furnish N from soil reserves and from applied fertilizer under variable conditions, and weather conditions available for growth. Fertilizer applications should be graduated according to size and number of stalks in the field, and the N applied within the boom stage considering time lags between application and complete uptake and between uptake and completion of resultant growth. The uptake period is about 3 or 4 mo. for normal applications under good conditions at Makiki, and resultant growth prolongation is generally proportionate to the amount taken up. The soils involved had a more or less constant available N content of from 12 to 17 lb. per acre after the first flush of N in fertilized plats had been lost. The single-application results indicated that the N release in Makiki soil is too slow and not enough to maintain the plant ideally at any time under growing conditions. For the sake of economy, in extremely short crops one application seems ideal; for long crops two or three are advisable.

"The important problems involved in fertilization are really the problems associated with the avoidance of excess N fertilization for the weather conditions under which the crop is expected to grow, rather than the problems dealing with specific N deficiencies."

Potash requirements for sugar cane, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 2, pp. 131-146, figs. 3).—Study of the uptake of K, growth, and juice characteristics by sugarcane varieties receiving different K applications indicated the need for a differentiation between K uptake by the sugarcane crop and its K requirement for optimum yields, for a luxury consumption of K by the cane plant was clearly shown. When only millable cane stalks leave the field, the actual amount of K that goes with them is not very large. Although the total K received from the soil by the growing crop may have been quite large, much of this K will be left in the trash, tops, and roots in the field. Indications were that the sugarcane plant could absorb some K from a nonexchangeable form in the soil, although the K taken up was not adequate for optimum yields, and that some of the applied soluble K salts were fixed in the soil in a nonexchangeable form. Different responses to K fertilization on soils low in K are suggested as possibly due to one or more of the phenomena noted above.

The sunflower, its cultivation and uses, A. M. HANNAY (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 20* (1941), pp. 18).—This list includes 77 annotated references.

Further studies of electricity in sweetpotato plant production, J. B. EDMOND and G. H. DUNKELBERG. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 499-500).—Continued experiments (E. S. R., 83, p. 548) with electrically heated plant beds for sweetpotatoes showed covers of Sunray glass and fertilizer sacks to produce more plants per root and bushel than muslin and Sunray cloth, although the latter consumed less electricity. A 10-in. spacing of the heating cable was more economical than the 7- and 13-in. spacings. When plant production per root and costs are considered, maintenance of temperature from 80° to 85° F. is recommended for commercial plant growers. Soil was a better bedding medium than sand or sawdust. Crowded bedding, 300 (v. 150) roots in 18 sq. ft., markedly increased plant production per unit area, used but little more electricity to maintain proper temperature, and did not increase rotting in bedded stock.

Flue-cured tobacco fertilizer recommendations for 1942, C. B. WILLIAMS ET AL. (Coop. U. S. D. A. and 4 States). (*North Carolina Sta. Agron. Inform. Cir. 130 (1941)*, pp. [2]+3).—Fertilizer formulas, acre rates, and sources of plant food are recommended by the Agronomy Tobacco Work Conference held at Oxford, N. C., July 25, 1941, for flue-cured tobacco and for plant beds on average soils in Virginia, North Carolina, South Carolina, Georgia, and Florida.

Tobacco in the Philippines, D. B. PAGUIRIGAN and P. P. TUGADE (*Philippine Jour. Agr.*, 11 (1940), No. 1-3, pp. 1-269, pls. 53, fig. 1).—The comprehensive account of the tobacco industry in the Philippine Islands includes a résumé of its history; types and varieties; climate and soil requirements; cultural and field methods; curing, fermentation, and packing practices; breeding and improvement; yields; production costs; insect pests and diseases and their control; manufacture of cigars, cigarettes, smoking and chewing tobacco, and byproducts; trade and commercial movement of tobacco; laws and regulations affecting the industry; promotion of the industry by research, extension, and crop adjustment; tobacco statistics; and a bibliography embracing 328 titles.

Wheat varieties in Washington in 1939, E. F. GAINES and E. G. SCHAFER (*Washington Sta. Bul. 398 (1941)*, pp. 22, figs. 2).—Survey of the 1939 wheat crop (E. S. R., 76, p. 623), made in cooperation with growers, revealed the presence of 13 varieties, each producing more than 500,000 bu., which accounted for most of the 43,687,000-bu. crop. The remaining 2,126,000 bu. consisted of 24 other varieties. The percentage of winter wheat in 1939 was 68.6; 1934, 61.3; and 1929, 60.9 percent. The production percentages by classes included hard red spring Marquis 0.6 percent; hard red winter Turkey 28.4, Redit 4.2, Oro 3.7, and Yogo 2.2; western red Triplet 6.1, Red Russian 0.5, Jones Fife 0.2, and Hybrid 123 0.2; hard white Baart 19.5 and Bluestem 1.9; soft white Federation 8.3; Rex 6.2, Fortyfold 2.2, Golden 0.6, Regua 0.4, and Thompson 0.3; and white club Hymar 8.5, Albit 2.7, Hybrid 128 1.1; and Jenkin 0.3. Red wheats made up 46.1 percent and white wheats 52 of the total; hard wheats 60.5 and soft wheats 37.6 percent. Adaptations and merits of the 6 leading and 6 secondary varieties are noted briefly, and the location and extent of their production shown on outline maps. Through a wheat improvement program, many varieties formerly grown have been replaced by others found superior and in many cases highly resistant to smut. The smut-resistant Turkey, Marquis, Redit, Albit, Hymar, Rex, Oro, Rio, and Yogo varieties have increased steadily from 17.9 percent of the total in 1918-19 to 56.7 in 1939. Their use and improved seed treatment has resulted in a steady decline in losses from smut.

Seed treatments with phytohormones and talc, J. A. DEFRANCE. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 679-682).—Treatments of seed of Rhode Island bent and Kentucky bluegrass with certain phytohormones and talc, with and without preseedling fertilization, did not result in noticeable increase in rate of germination of treated seeds or in top growth differing much from the controls, a consistent increase in density, differences in length or amount of roots, or control of large brown patch disease. Top growth and density increased decidedly in those where preseedling fertilizer was used.

Weed-control methods influence subsequent weed types, R. J. B[ORDEN] (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 3, pp. 150-154, figs. 4).—The plant crop of 32-8560 sugarcane received one early hand hoeing and subsequent weed-control sprayings. In the ratoon crop, plats that were not weeded further, with and without extra N, contained fast-growing succulent weeds which apparently were suppressing the grasses. Where standard herbicides were used for weed control in the previous crop of cane, succulent easily killed weeds had disappeared and the tougher, wiry, grassy types had be-

come more firmly established. Four hand hoeings to control weed growth apparently suppressed easily killed weed types, but left seed of the tougher grasses not so easily controlled.

The use of fertilizer for controlling the pond weed, *Najas guadalupensis*, E. V. SMITH and H. S. SWINGLE. (Ala. Expt. Sta.). (In *Transactions of the Sixth North American Wildlife Conference*. Washington, D. C.: *Amer. Wildlife Inst.*, 1941, pp. 245-251, figs. 2).—*N. guadalupensis* has been controlled in fish ponds in Alabama by the use of inorganic fertilizers which induce a heavy growth of algae, either filamentous or plankton, apparently shading out the weed. The production of fish food, growth of fish, and ease of fishing also were improved by such use of fertilizer.

HORTICULTURE

Nomographic charts for the rapid computation of measurement ratios of horticultural products, K. C. BARRONS. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 589-592, figs. 3).—Charts prepared for the direct computation of shape index in tomatoes and cabbage (i. e., ratio of polar to equatorial diameter) and also a chart of similar design for the direct computation of the ratio of petiole to entire leaf length in celery make possible the obtaining of a direct ratio value from caliper measurements without computation. Directions for the construction and use of the charts are given. It is suggested that the charts could be easily adapted for the computation of measurement ratios of other horticultural products.

Storing some vegetable seeds, P. A. RODRIGO and A. L. TECSON (*Philippine Jour. Agr.*, 11 (1940), No. 4, pp. 383-395, figs. 5).—Records taken over a period of 41 mo. on the viability of 10 kinds of vegetable seeds, stored in sealed and unsealed vials, showed varietal variations and within each variety a marked influence of the type of storage. In all cases the loss of viability was very rapid in the unsealed containers, with complete loss in the most durable kinds in 21 mo. An increase in the weight of seeds in the unsealed vials is attributed to moisture absorption. In the sealed vials the shortest-lived seeds lasted 27 mo., and the longest-lived species, eggplants, Chinese cabbage, and peppers, were still germinating after the experimental period of 41 mo. A peculiar phenomenon was noted in certain species stored in the sealed vials whereby, after several months during which viability had slowly declined, there was recorded a well-defined rise in the percentage of viable seeds.

Calendario regional de prácticas y tratamientos insecticidas y fungicidas [Regional calendar of methods and insecticidal and fungicidal treatments], A. S. DE LOS HEROS (*Lima, Peru: Min. Fomento, Dir. Agr. y Ganad.*, 1939, 2. ed., pp. 39).—Control recommendations for Peru by months are presented for fruits and garden and flower crops.

[Horticultural studies by the New Haven Station] (Connecticut [New Haven] Sta. Bul. 446 (1941), pp. 417-419, 427).—Among studies, the progress of which is discussed, are the breeding of hybrid sweet corn and summer squash, the improvement of beets, the effect of season of growth on the color of beet roots, and the breeding of strawberries, all by D. F. Jones; and the effect of staking and pruning tomatoes and of supplemental nitrogen applied to tomatoes during the growing period, both by M. F. Morgan.

[Horticultural studies by the Indiana Station] (Indiana Sta. Rpt. 1940, pp. 40, 74-78, 79-80, 83-84, 85, figs. 4).—Studies discussed include the breeding of sweet corn, by G. M. Smith (coop. U. S. D. A.); management of orchards, by C. E. Baker; cover crops for orchards, by Baker and L. Greene; storage investigations, by Baker and I. D. Mayer; plum and peach variety tests, by C. L.

Burkholder; the dusting and spraying of apples, by Burkholder, D. L. Johnson, and O. W. Ford; a comparison of portable and stationary spray outfits, by Burkholder and T. E. Hinton; stock and scion investigations, and varieties of pears, both by J. A. McClintock; production and marketing of muck soil crops, by N. K. Ellis; the production and marketing of vegetables grown on sandy soil, by J. D. Hartman and F. C. Gaylord; organic matter requirements of vegetables on sandy soil, by Hartman; factors affecting tomato quality, by Hartman and E. C. Stair; tomato seed production, by Stair; and the effect of vitamin B₁ and other growth substances on cuttings, growth of rose and cosmos, and cucumber fruits, by N. W. Butterfield.

[**Horticultural studies by the Nebraska Station**] (*Nebraska Sta. Rpt.* [1940], pp. 22-23, 25-27, 65, fig. 1).—Included are reports on the effect of supplemental water on the size and yield of apples, effect of cultural treatments on the soil moisture in vineyards and apple orchards, orchard spraying for insects, effect of sodium thiocyanate on the coloring of apples, tomato breeding and variety testing, improvement of carrots by selection, variety tests of eggplants and lima beans, and the irrigation and mulching of vegetables. Brief notes are presented on tests of apples, crab apples, and ornamental plants at the North Platte Substation.

[**Horticultural investigations by the North Carolina Station**]. (Partly coop. U. S. D. A.). (*North Carolina Sta. [Blen.] Rpt.* 1939-40, pp. 30-33, 33-38, 40, 42, figs. 5).—Information is presented on studies relating to the use of chemical sprays in reducing the premature dropping of apples; nematode-resistant peach rootstocks; competition between crabgrass and peach trees for soil moisture; relation of nutrient deficiency to the susceptibility of peach trees to bacterial fruit and leaf spot diseases; breeding of raspberries, blueberries, and strawberries; relation of leaf area to fruit production in the strawberry; effect of preceding crop on the growth of strawberries; fertilization and liming of strawberries; breeding of tipburn-resistant lettuce; fertilization of the pickling cucumber and narcissus; and the breeding of carnations.

[**Horticultural studies by the University of Puerto Rico Station**] (*Puerto Rico Univ. Sta. Rpt.* 1940, pp. 32-38, 46-47, 47-49, 54, 55-57, figs. 2).—In this general progress report, information is presented on studies of coffee with respect to fertilizers, shading, asexual propagation, effect of different solar radiation intensities, the root system of *Coffea arabica*, pruning, nutrient requirements, and the comparative yield of Columbian and Puerto Rican varieties, all by J. Guiscafré Arrillaga and L. A. Gómez. Included also are studies of mildew-resistant cucumbers, and eggplants resistant to bacterial wilt, both by A. Roque; muskmelon varieties, and onion varieties with respect to thrips resistance, both by A. Riollana; the propagation of mangoes, avocados, and citrus, by J. Simons; effect of pH of culture solution on the growth of the pineapple, and the effect of waxing pineapple fruits on their keeping quality, both by N. A. Schappelle.

[**Report of the pomology department**], M. B. CRANE (*John Innes Hort. Inst. Ann. Rpt.*, 31 (1940), pp. 4-6).—Included are reports of studies on the production of seedless pears by the stimulus of cross-pollination; physiology of incompatibility in the pear and other plants; induction of polyploidy in plums, cherries, and pears; fertility in *Rubus*; xenia in plums; parthenocarpy in the cucumber; and hybrid vigor in the tomato.

Cabbage varieties studied for value to truck growers, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 8, p. 2, fig. 1).—Three years' studies at Crystal Springs showed Dark Green Copenhagen, Resistant Detroit, and Ferry Round Dutch to be the most productive early varieties. The first two varieties were as early as Golden Acre. For southern Mississippi, where periods of low temperature are not long enough to influence seedstalk formation

and plantings are made in November and December, Dark Green Copenhagen, Resistant Detroit, and Golden Acre varieties are recommended. Farther north in the State, it is advised that a nonbolting variety such as Round Dutch be included in the plantings to safeguard the crop from complete seeding.

Indoor composting for mushroom culture, E. B. LAMBERT (*U. S. Dept. Agr. Cir. 609 (1941), pp. 15, figs. 4*).—A method of fermenting organic composts indoors under controlled conditions is described. In shallow layers of compost, such as standard mushroom beds, fermentation conditions of temperature, moisture, and aeration were controlled sufficiently near the optimum to produce a satisfactory mushroom compost in less than 2 weeks. The indoor method had the advantage of permitting the experimenter to conduct preliminary tests in small glass containers and later, in making yield tests, to replicate composting conditions in trays or test plats without the expensive replication of outdoor compost heaps. The quality of the mushrooms produced from indoor composting was equal to that of mushrooms produced from beds composted in the open. Based on the results, practical suggestions are presented for the commercial grower.

The effect of various growth-promoting chemicals on the production of tomato fruits in the greenhouse, M. C. STRONG (*Michigan Sta. Quart. Bul., 24 (1941), No. 1, pp. 56-64, figs. 3*).—Applications of indolebutyric acid and certain proprietary compounds thereof to the flowers of the John Baer tomato resulted in fruits of normal color and flavor, but seedless. The best time for applying the chemical was at anthesis, when the corolla was completely reflexed. Lanolin paste was a satisfactory medium for the hormone. Application of the paste to the surface of the style cut off at about 3 mm, from the ovary was effective, giving better results than one application to the stigma. Indolebutyric acid at 0.5-percent concentration proved the most effective of the several chemicals tested. Various solvents for indolebutyric acid were tried with promising results in certain cases. Hormone treatment stimulated the development of the ovary, in some cases reducing the average time to harvest by as much as 5 days.

The Pan America tomato, a new red variety highly resistant to Fusarium wilt, W. S. PORTE and H. B. WALKER (*U. S. Dept. Agr. Cir. 611 (1941), pp. 6, figs. 3*).—Information is offered as to the origin and development, distinguishing characteristics, yielding capacity, season and adaptability, and sources of seed. The paternal parent was a small-fruited form of *Lycopersicon pimpinellifolium*, found growing wild in Peru, and the maternal parent was of the Marglobe variety. Size of fruit was obtained by backcrossing the F₁ hybrid to inbred Marglobe lines. Pan America is outstanding because of its high resistance to the widely distributed soil fungus *Fusarium bulbigenum lycopersici*.

Questions and answers on fruit culture: Orchard tree fruits, N. E. HANSEN (*South Dakota Sta. Cir. 35 (1941), pp. 30*).—Information is presented on the possibilities of fruit and nut growing in South Dakota, species and varieties, propagation, cultural care, protection from pests and winter injury, pruning practices, etc.

Pruning hardy fruit plants (*U. S. Dept. Agr., Farmers' Bul. 1870 (1941), pp. II+46, figs. 37*).—Discussing the principles underlying the pruning of woody plants, information is given on the time of pruning, healing and treatment of wounds, pruning tools, and specific suggestions for handling various tree fruits, grapes, and bush fruits.

Failure of seedlings of apple, peach, pear, and rose to respond favorably to vitamin B₁, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 339-340*).—Detailed measurements on apple, pear, peach, and rose seedlings, following 12 weeks' treatment with vitamin B₁,

failed to show any significant differences resulting from the vitamin treatment, whether the plants were growing in soil or sand. All the plants, both the treated and controls, made satisfactory growth except the rose seedlings, which suffered from damping-off and mildew.

Fruit waxing in relation to character of cover, L. L. CLAYPOOL and J. R. KING. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 261-265).—In waxing experiments with apricots, nectarines, pears, and tomatoes, it was found that the nature of the wax material appeared to be more important than the thickness of the film. The character of the fruit surface was also important, for example, in the Winter Nelis pear and the Stanwick nectarine the large lenticels increased the difficulty of effective waxing. No consistent relationship was found between surface tension and coverage or water-loss control.

Seedling apple stocks of known origin in nursery and orchard tests, G. E. YERKES and R. D. ANTHONY. (Pa. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 331-335).—Evidence that the parentage of the seedlings used as rootstocks may affect the size of the resulting trees was obtained in studies in 11-year-old orchards established with commercial varieties on known roots. In one orchard, Delicious seedlings resulted in considerably larger York Imperial trees than did Gano, Ben Davis, or French crab seedlings. In another location, Wealthy seedlings produced larger York Imperial trees than did Winesap, Winter Banana, or Golden Russet seedlings. A large loss of Gallia Beauty trees worked on Red Siberian Crab indicated marked incompatibility in this combination.

Three-year performance of sixteen varieties of apples on Malling IX rootstocks, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 321-327, figs. 2).—Observations during the first three seasons in the orchard on 16 varieties of apples propagated on Malling IX, a dwarfing rootstock, showed well-marked varietal characteristics in growth and performance. All the trees were vigorous, and in the third year all varieties fruited. Bloom occurred a week or 10 days earlier than in the same varieties on French crab roots, and the fruits of red-colored kinds were of unusually fine color and very uniform size.

Terminal-shoot growth of apple varieties as apparently stimulated by Virginia Crab and Hibernial intermediate stocks, M. T. HILBORN and J. H. WARING. (Maine Expt. Sta. and Univ. Maine). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 316-320).—A study of the growth of young apple trees, with and without an intermediate trunk of Virginia Crab or Hibernial, showed that the intermediate trunk had invigorated the growth of the top variety. The difference in favor of the intermediate stock trees was significant with one exception, that of Delicious with the Hibernial trunk. Since none of the scions was more than 4 yr. of age, the study was to be continued to determine the permanency of the effects.

The response of McIntosh apple trees to improved sub-soil aeration, A. J. HEINICKE and D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 27-31).—That aeration of the soil plays an important role in the welfare of apple trees was demonstrated in studies with McIntosh trees located on nearby plats, one of which was tilled much more frequently than the other. The trees on the well-drained plat made much more growth and showed much better survival. Determinations of the oxygen and carbon dioxide contents of the soil air collected from permanent gas sampling tubes installed in each plat showed much more oxygen and less carbon dioxide in the soil of the well-tiled area. In general, but not always, low oxygen was accompanied by high carbon

dioxide. The authors stress the need of determining soil aeration conditions before establishing an orchard.

Spraying to control preharvest drop of apples, L. SOUTHWICK and J. K. SHAW (*Massachusetts Sta. Bul. 381 (1941), pp. 16, fig. 1*).—Using commercial preparations and pure naphthaleneacetic acid, the author found that the influence of the chemicals on fruit dropping was not manifested immediately but that an interval of from 1 to 5 days may elapse before measurable effects were evident. After the effect was evident, its duration was dependent largely on the variety of apples. With McIntosh most of the tests indicated a period of about 10 days of effectiveness. As to the best time to apply the spray, it appeared advisable to wait until the preharvest drop had begun and then use one application. There was evidence that the effectiveness of a hormone spray on McIntosh trees may become progressively less pronounced as the crop becomes more mature on the tree. Weather conditions apparently affect the results, with high temperatures increasing and low temperatures decreasing the beneficial response. The best results were obtained when sufficient spray was applied to wet the tree thoroughly, with evidence that the liquid should contact the fruit stems. The addition of summer spraying oil, 1 pt. per 100 gal., increased the effectiveness of the hormone spray to a moderate extent. Certain environmental and orchard management factors, such as N fertilization, are said to have a bearing on the dropping of fruit and the effectiveness of hormone sprays. Various economic considerations are discussed.

Controlling the pre-harvest drop of apples, M. B. HOFFMAN ([*New York*] *Cornell Sta. Bul. 766 (1941), pp. 18, figs. 4*).—The dropping of apples just prior to the development of good color and proper maturity is a serious problem with certain varieties, such as McIntosh. Certain cultural practices, such as heavy N fertilization, heavy mulching, and late cultivation, tend to increase the preharvest drop. Any system of culture that tends to reduce soil nitrates and excessive moisture during the late summer tends to reduce dropping and give better-colored fruits. Conditions of low carbohydrate supply tend to magnify the dropping problem, and there was evidence that wet seasons and high temperatures during harvest were also concerned. Hormone sprays (naphthaleneacetic acid and its sodium salts) proved very effective in reducing preharvest dropping in summer varieties such as Williams (=Williams Early Red), Early McIntosh, and Oldenburg (=Duchess). With the McIntosh variety it was found that the timing of the spraying operation was highly important, with indications that the application should be made about when the drop of sound marketable fruit begins. Thorough spraying was essential using sufficient pressure to force the spray in and around the cluster bases and stems of the fruits. In the trials, about 1 to 1.25 gal. of material (0.0005 or 0.001 percent solutions) was used for each bushel of fruit on the trees. There was no evidence that a duplicate application prolonged the period of drop control. With the McIntosh, one well-timed application may control dropping for from 10 to 12 days and permit the apples to mature properly.

Protection against loss of moisture in common storage by Golden Delicious apples, D. D. HEMPHILL and A. E. MURNEEK. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 222-224, fig. 1*).—The tendency for Golden Delicious apples to lose excessive amounts of water in common storage was overcome to a considerable degree by coating fruit with wax emulsions. Wrapping in paper was helpful, but to a lesser extent than waxing, and there was no significant difference in the loss from wastage due to storage diseases between the waxed and the unwaxed fruits. It is suggested that waxing may have practical value if a relatively high humidity is maintained in the storage room and if the common storage period is comparatively brief.

Further studies relating to the effects of certain waxing treatments on the subsequent storage quality of Grimes and Golden Delicious apples, C. W. HIRTZ and I. C. HAUT. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 249-256, figs. 5).—Continuing the study (E. S. R., 82, p. 49) of the effect of coating Grimes Golden and Golden Delicious apples with wax emulsions, a significant reduction was recorded in weight loss in the treated fruit during and subsequent to storage. The effectiveness of the wax treatment was shown in a reduction in the number of wilted fruits that had to be discarded at the end of the storage period. Waxing after preripening for 1 week at 60° F. did not adequately control scald as was recorded in the earlier experiments.

Peach varieties in Arkansas, J. E. VAILE (*Arkansas Sta. Bul.* 414 (1941), pp. 28).—Based on records taken at the main station and at the substations at Hope, Marianna, and Stuttgart, it was evident that varieties of peaches differ in their adaptability, some doing well in all locations and other being more restricted in their favorable response. Alton, Belle, Carman, Champion, Early Rose, and Elberta were productive, and Hiley fairly so, at all locations. Elberta Cling was unproductive at the three branch stations. Early Elberta and Rochester were productive at the substation at Hope. Considerable difference was noted among varieties in their capacity to withstand low temperatures. At Fayetteville, Henrietta Cling, Krummel, and October Beauty yielded fair crops following -4° F. in January, with no other kind setting fruit. At Hope, Belle, Early Rose, Greensboro, and Rochester escaped serious injury at a temperature of -8°, occurring during the dormant period. Winter and spring temperatures were apparently controlling factors in fruit production of the varieties as a whole. As a rule, a temperature of 20° or lower occurring 7-10 days before bloom and 24°-25° occurring during the flowering period caused serious injury. The degree of injury resulting from comparable low temperatures occurring at relatively the same time in relation to the development of buds and flowers varied from year to year. On a basis of a capacity to set and mature crops in years when other varieties failed, Slappey, Early Rose, Rochester, Honey, and Ideal were outstanding. No relation was observed between the time of bloom and the relative productivity of varieties. Late-maturing kinds were less productive, however, than early and midseason varieties.

New varieties of peaches described for trial planting, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 7, pp. 1, 8).—Information is presented on the dates of ripening and fruit characteristics of several new varieties of peaches recently planted by the station.

The potassium nutrition of fruit trees.—III, A survey of the K content of peach leaves from one hundred and thirty orchards in California, O. LILLELAND and J. G. BROWN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 37-48).—In continuation of this study (E. S. R., 82, p. 771), analyses of leaf samples showed a considerable variation in K content but no evidence that the trees were suffering from a lack of this element. No distinctive leaf symptoms, such as scorched edges or rolling, were observed on the trees which showed a low leaf content of K. Monthly analyses of peach leaves through several seasons showed the smallest change in K during June and July, suggesting that this is the most suitable time for surveying K conditions in peach orchards. No distinct varietal differences in leaf K could be established during June and July among the varieties Elberta, Lovell, Paloro, and Phillips.

The relation of peach root toxicity to the re-establishing of peach orchards, E. L. PROEBSTING and A. E. GILMORE. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 21-26, figs. 2).—Investigating the causes of the poor development of peach trees when replanted directly on sites from which old

peach trees had been removed, it was found that peach root residues were harmful to the growth of the young trees. As shown in sand cultures, the bark rather than the wood of the roots contained the toxic factor. The alcohol extract of the root bark was injurious, while the residue following alcohol extraction was not harmful. The identity of the specific toxic compounds is being determined.

Sprays that break the rest period of peach buds, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 45-47).—Among some 40 substances tested for their capacity to break the rest period of peach buds which had not been subjected to sufficient cold weather for natural breaking, three materials, ρ -thiocresol, 4-chloro-*o*-phenylphenol, and α -nitronaphthalene, were found promising when applied as sprays in the proper solvents.

Carbon dioxide treatment of strawberries and cherries in transit and storage, A. VAN DOREN, M. B. HOFFMAN, and R. M. SMOCK. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 231-238, figs. 2).—Chesapeake strawberries transported from Salisbury, Md., to Ithaca, N. Y., in a gas-refrigerated truck in an atmosphere containing 25 percent CO₂ kept in excellent condition during the journey. Subsequent storage at different temperatures and CO₂ concentrations indicated that a temperature of 50° F. and a 15-percent CO₂ concentration is the most desirable treatment for the Chesapeake variety. Good results from CO₂ were obtained also with varieties grown in New York State. Sweet cherries were successfully handled in gas storage, with indications that a concentration of 20 percent CO₂ at 40° was most favorable for this fruit.

The effect of time of mulching on the cold resistance of strawberry plants, W. G. BRIERLEY and R. H. LANDON. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 424-426).—Despite the fact that early mulching of strawberry beds is often recommended for northern areas, controlled experiments with Beaver strawberry plants, grown in outdoor frames and covered with 3 in. of straw at weekly intervals from October 7 to November 11, indicated that early mulching may actually be harmful by preventing the natural hardening processes. Plants from the later-mulched lots were more resistant to low temperatures than were those from the earlier-covered lots. The proper time to apply mulches will vary with seasonal conditions, but it was evident that exposure to early-season frosts is necessary.

Dates for applying blueberry fertilizer, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 451-454, fig. 1).—The yield of Rubel blueberries growing on sandy soil was practically doubled by the use of a 7-12-7 fertilizer applied at the rate of 600 lb. per acre per year. The time of application was not found highly important, with evidence that blueberries may be fertilized to good advantage at any time during the period April 15 to June 15. When the year's allotment of fertilizer was divided into three parts, the last third applied in October, yields were as good as when all the fertilizer was applied in the spring.

The effect of lime applications on the growth of cultivated blueberry plants, J. S. BAILEY. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 465-467, figs. 3).—Measured in terms of new growth and in the appearance of the foliage with respect to chlorosis, even very small applications of lime proved harmful to Rubel blueberries growing on soil in which the lime was mixed prior to planting. Additions of lime insufficient to increase the pH of the soil permanently above that of the unlimed controls reduced the growth of the twigs.

Carbon dioxide-oxygen and storage relationships in cranberries, A. S. LEVINE, C. R. FELLERS, and C. I. GUNNESS. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 239-242).—The most favorable storage tempera-

ture for mature cranberries as measured by storage losses was 35° F. "Green" or partly colored berries required a temperature of 45° to take on a satisfactory color in storage. A temperature of 45° during the filling of the storage and for a brief interval thereafter is recommended as a satisfactory means of decreasing refrigeration costs without serious detriment to successful keeping.

An instance of boron deficiency in the grape under field conditions, L. E. SCOTT. (S. C. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 375-378).—An abnormal condition of grape foliage in which chlorotic areas developed near the leaf margin and between the veins, observed on vines growing in the Sandhill area, was prevented by application of commercial borax at the rate of 10 lb. per acre. Yields were greatly increased the succeeding year on the treated vines. Varieties differed markedly in their response to boron deficiency, with the more vigorous varieties showing little or no injury. The grafting of susceptible varieties on vigorous rootstocks reduced greatly their tendency toward injury.

Clonal selection of grapefruit with respect to yield, W. H. FRIEND and S. H. YARNELL. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 358-362).—Records taken on young trees propagated from high- and low-yielding Marsh and Thompson grapefruit trees showed approximately equal results for both types of selection, suggesting that differences among the parent trees were due largely, if not entirely, to environment. It is considered possible, however, that one might by chance come upon a true genetic mutation which would possess different yielding capacity than was normal for the variety.

Papaya production in the Hawaiian Islands (Hawaii Sta. Bul. 87 [1941], pp. 64, figs. 24).—This bulletin presents general information (E. S. R., 30, p. 841) under five sections: I, The Botany and Sex Relationships of the Papaya, by W. B. Storey (pp. 5-22); II, Propagation and Culture of the Papaya, by W. W. Jones and W. B. Storey (pp. 23-31); III, Diseases of Papaya in Hawaii and Their Control, by G. K. Parris (pp. 32-44); IV, Insect Pests of Papaya and Their Control, by F. G. Holdaway (pp. 45-51); and V, Harvesting, Marketing, and Uses of Papaya, by W. W. Jones (pp. 52-60).

A physiological study on the effects of waxing pineapples of different stages of maturity, N. A. SCHAPELLE (*Puerto Rico Univ. Sta. Res. Bul. 3* (1941), pp. [1]+32, figs. 8; *Sp. abs.*, pp. 30-32).—Coating pineapples in the "shipping green" stage with a wax emulsion of about 4-percent concentration did not interfere materially with color development, but as the paraffin emulsion was increased in concentration from 4 to 12 percent color changes were progressively less satisfactory. Shipping-green fruit did not change color at all when coated with 16- and 24-percent emulsions. The weight losses were reduced about 35-45 percent by the 4-percent paraffin coating. Coating the crown leaves was less effective than coating the fruit in reducing weight losses. Of various wax materials used, paraffin proved most effective. The juice of unwaxed plant-ripened fruits increased in sugars and held constant in acid concentration during storage. Under like conditions, the juice of shipping-green fruit decreased in concentrations of both acids and sugar. Waxing of shipping-green fruit with a 4-percent emulsion tended to further decrease the acid concentration during storage. Waxing of fully ripened fruits did not materially affect sugar concentration changes in storage. The fact that the shipping-green fruit lost appreciably more acids during storage than did partly ripened fruits is believed associated with a higher carboxylase content and consequently more rapid utilization of acids in the immature fruits. Acids are probably of particular importance in respiration when some factor, such as a wax coating, interferes with normal respiration of the sugars. Presumably, when the O₂ supply is

retarded by a heavy wax coat, anaerobic respiration using the acids results in the accumulation of incompletely oxidized products such as alcohols and aldehydes.

Notes on narcissi, H. W. PUGSLEY (*Jour. Bot. [London]*, 77 (1939), No. 924, pp. 333-337).—*Narcissus provincialis* n. sp. and its new variety *bicolorans* are described.

Experiments on the culture of hybrid tea roses, A. G. SMITH, JR. (*Virginia Sta. Bul.* 334 (1941), pp. 32, pls. 2, figs. 9).—In cultural experiments, it was found that the preparation of the soil to a depth of 20 in. gave better results than did shallow preparation, particularly when rotted manure was worked into the lower 10 in. It was evident that fertilizers high in phosphate and potash and low in readily available nitrogen resulted in hardy, vigorous development. No material difference in the number of flowers or the character of the growth was observed whether the plants were fertilized with superphosphate or bone meal. The hilling of established hybrid tea roses was unnecessary for winter protection. A mulch of sawdust or straw applied in February delayed the onset of spring growth and lessened the damage from late frosts. Sawdust, composed of two-thirds oak and one-third pine, applied as a mulch 3 successive years, did not increase the acidity of the soil. In fact, in none of the experiments was any effect of soil pH on the plants noted. Pruning canes to a height of 18-24 in. resulted in more flowers of better color than did pruning to 6-12 in. Close spacing, 14-18 in., reduced the number of leaves and flowers as compared with wider spacing under the high system of pruning practiced. Information is presented on the growth, flower production, and resistance to black spot of a number of varieties of hybrid tea and polyantha roses.

Filberts, G. L. SLATE (*New York State Sta. Cir.* 192 [1941], pp. 14, figs. 4).—Information is presented on botanical features, varieties, propagation, culture, pollination, pruning, control of pests, harvesting practices, etc.

Propagation of umbrella-pine by hormone-treated cuttings, W. L. DORAN. (Mass. Expt. Sta.). (*Florists Exch. and Hort. Trade World*, 97 (1941), No. 9, p. 9).—The best rooting (92 percent in 20 weeks) obtained with cuttings taken in late January from 60-year-old trees, resulted from treatment for 2 hr. with naphthaleneacetic acid, 100 mg. per liter of water. Indolebutyric acid was definitely less effective, irrespective of dilution or method of treatment.

FORESTRY

[Forestry studies by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 446 (1941), pp. 414-416, 416-417).—There is discussed a survey of materials and methods for preserving posts cut from native species, such as oak, maple, birch, white cedar, pitch pine, and chestnut; better methods for producing charcoal; and the production and distribution of forest planting stock, all by W. O. Filley.

[Forestry studies by the Indiana Station] (*Indiana Sta. Rpt.* 1940, pp. 66-69, figs. 2).—Among studies, the progress of which is discussed, are management of wood lots and fertilization of black locust in forestry nurseries and the influence of windbreaks on wind velocities, all by D. DenUyl.

Forest resources of the Upper Peninsula of Michigan, R. N. CUNNINGHAM and H. G. WHITE (*U. S. Dept. Agr., Misc. Pub.* 429 (1941), pp. VIII+32, pl. 1, figs. 10).—This report presents statistics on forest areas, timber stands, growth and drain, industries, and employment. It is pointed out that continued clear-cutting of old-growth forests and the failure to protect and stimulate reproduction are reducing productivity to a disastrous degree and adding to the present eco-

onomic problems. Suggestions are presented for the better handling of the forests and forest lands, with a view to placing them on a sustaining basis.

Light and temperature as factors in the germination of the seed of Douglas fir (*Pseudotsuga taxifolia* (Lamb.) Britt), G. S. ALLEN (*Forestry Chron.*, 17 (1941), No. 3, pp. 99-109, figs. 3).—Stratification in washed sand exerted a profound effect upon the germination rate and the total germination attained by Douglas fir seed. Within the range studied (maximum temperatures of 69.8° to 95° F.), germination temperature had no effect on the rate of germination or upon the total germination of stratified seeds, but had a decided effect on untreated seed, the higher temperatures accelerating germination markedly. The effect of light treatment was much less than that of temperature. Since most naturally sown seed drops to the ground in autumn and is exposed to a set of conditions approximating stratification, it is concluded that temperature rather than light would be the limiting factor under natural environments. The application of stratification technics to nursery practices is indicated.

A study of the effects of eucalypts on the soil, their nutrient requirements, and transpiration, M. IRVING (*So. African Jour. Sci.*, 37 (1941), pp. 133-135).—Observations in South African eucalyptus plantings showed that soil moisture is much lower than in adjacent native scrub forests. Transpiration studies showed that the eucalyptus uses large amounts of water. As a practical suggestion, it is advised not to plant eucalyptus near a water supply or to plant economic crops too near eucalyptus windbreaks.

DISEASES OF PLANTS

The Plant Disease Reporter, [August 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), Nos. 14, pp. 365-389, pl. 1; 15, pp. 391-410, fig. 1).—In addition to the host-parasite check-list revision, by F. Weiss (No. 14, *Mahonia* to *Malus*, and 15, *Malvastrum* to *Musa*), the following items are noted:

No. 14.—A survey of cotton seedling diseases in 1941 and the fungi associated with them, by P. R. Miller and R. Weindling; weather and winter drying of plants, by E. P. Felt; freak weather injures rhododendrons, by P. P. Pirone; early blight and other diseases of tomatoes in east Texas in 1941, by G. E. Altstatt and P. A. Young; reports on potato late blight and bacterial ring rot in Pennsylvania, and on late blight and other potato diseases in New York; and brief notes on *Septoria* leaf spot on safflower in north Texas, only light damage by scab and rust to barley crop, and damage caused by appearance of flax anthracnose in California.

No. 15.—*Fusarium* dieback of American holly, by T. R. Bender (E. S. R., 85, p. 782); "X" disease of peach and chokecherry found in Michigan, by D. Cation; *Rosellinia* root rot of alfalfa in California, by M. R. Harris; potato late blight in up-State New York, by M. F. Barrus; and some unusual occurrences of plant diseases, including *Heterodera schachtii* in a Long Island potato field, active spread of peach yellows in northern Virginia, unusual occurrence of scab on prunes in California, and vascular wilt of the mimosa tree in eastern Virginia.

[Plant disease studies by the Connecticut [New Haven] Station]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 446 (1941), pp. 412, 416, 421-424).—Brief reports are included on control and eradication work and spread of the Dutch elm disease in the State, its transmission by elm bark beetles, and the mechanism of attack by the fungus; control of white pine blister rust; vegetable diseases, including the *Alternaria solani* defoliation disease of

tomatoes and its control by nitrate of soda dressings and by fungicidal sprays; diseases of ornamentals, including wind-scorch of conifers, laurel, and rhododendron, *Botrytis* blight of tulips, rose powdery mildew, and control of chrysanthemum leaf nematode; trials of new fungicides on apples, and naphthaleneacetic acid for reducing fruit drop in the McIntosh variety; X-disease of the peach; and investigations of new organic fungicides.

[**Plant disease work by the Indiana Station**]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1940*, pp. 20-21, 38-40, 40-45, 84, figs. 2).—Brief progress reports, by R. H. Wileman, R. C. Baines, G. B. Cummins, A. J. Ullstrup, H. R. Thomas, R. W. Samson, V. Wright, R. E. Lincoln, R. M. Caldwell, L. E. Compton, N. K. Ellis, G. E. Marshall, and E. R. Honeywell are included on studies of the taxonomy of the plant rust fungi; inheritance of susceptibility in the dent corn inbred Pr to infection by *Helminthosporium maydis*, race 1; diseases found in direct-seed v. transplanted tomato plants; source of *Bacterium vesicatorium* (= *Phytophthora vesicatoria*) spot infection on tomatoes; defoliation of deflorated, late-set, and variously fertilized tomato plants; resistance to *Fusarium* wilt and defoliation diseases in tomato; host specialized races of loose smut of wheat; control of cherry leaf spot on nursery trees; spraying and depth of plowing in control of peppermint anthracnose; sulfur sprays for apple scab control; and resistance of China aster varieties to *Fusarium* wilt.

Plant diseases (*Nebraska Sta. Rpt. [1940]*, pp. 27-29).—Reports of progress are given on studies of potato diseases, including resistance to *Fusarium* wilt and scab, bacterial ring rot, and the "haywire" disease of unknown cause; and resistance of bean varieties and hybrids to bacterial blights.

[**Phytopathological work by the North Carolina Station**]. (Partly coop. U. S. D. A.). (*North Carolina Sta. [Bien.] Rpt. 1939-40*, pp. 15, 21-22, 26-28, 29-30, 41, fig. 1).—Brief reports are given on the control of cotton wilt by resistant varieties and liberal amounts of potash; mosaic streak of cowpeas; copper-sulfur dusts and copper sprays for peanut leaf spot control; production of vigorous tobacco seedlings free from downy mildew (blue mold) by proper plant-bed management coupled with copper oxide oil mixture spray or paradichlorobenzene gas treatment; the value of nitrogen and phosphate fertilizers in decreasing Granville wilt of tobacco and of crop rotations in the control of this disease and root knot nematodes; viability of tobacco mosaic virus in the soil; apple disease control in the State, especially for scab, bitter rot, black rot, and blotch parasites; and control of leaf diseases of cantaloups by fungicidal dusts and fertilizers.

[**Phytopathological studies by the Puerto Rico University Station**] (*Puerto Rico Univ. Sta. Rpt. 1940*, pp. 39-41, 42-43, 47, 49-51, 51-52, 54-55, 57-59, figs. 4).—Reports of progress, by L. A. Alvarez, J. Adsuar, L. A. Serrano, and N. A. Schappelle, are given on a new fungus (*Fusarium* sp.) associated with the so-called black root rot of coffee; *Gloeosporium manihotis* dieback of cassava; cucumber diseases, including incidence of cottony leak, diminished acreage due to mosaic, and damage in transit by *Mycosphaerella* rot of fruit; pepper mosaic limiting expansion of this crop; outbreak of tomato wilt due to *Bacterium* (= *Phytophthora*) *solanacearum*, and notes on early blight and fruit rots; avocado wilt associated with *Fusarium* sp.; rots responsible for loss of over half the papaya fruits produced, and mosaic endangering commercial plantings; and iron chlorosis of pineapple due to excessive manganese, and control of root rot in water cultures by CuSO_4 solution.

Versuche über die Wirkung von Bariumverbindungen auf das Pflanzenwachstum [Studies of the action of barium compounds on plant growth], S. GERICKE (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz*, 18 (1940), No. 5-6, pp. 69-75, figs. 3).—The experimental data presented indicated that Ba—and espe-

cially the nitrate—is to be regarded as highly poisonous to plants, acting injuriously even in relatively low concentrations. These facts deserve careful consideration relative to the use of $Ba(NO_3)_2$ in fertilizer tests, in order to avoid false inferences from their results.

Novas especies de "Elsinoë" e "Sphaceloma" sobre hospedes de importancia economica (New species of "Elsinoë" and "Sphaceloma" on hosts of economic importance), A. A. BITANCOURT and A. E. JENKINS. (U. S. D. A. et al.). (Arq. Inst. Biol. [São Paulo], 11 (1940), pp. 45-58, pls. 15; Eng. abs., pp. 55-56).—The following new species are described: *S. arachidis* on peanut, *E. pitangae* on *Eugenia pitanga* (Surinam cherry), *Elsinoë jasminae* on *Jasminum sambac* (Arabian jasmine), *S. zorniae* on *Zornia diphylla*, *S. rhois* on *Rhus vernix*, *E. talisiae* on *Talisia esculenta*, and *E. clethrae* on *Clethra brasiliensis*. Abundant infection on peanut resulted from inoculation with a culture of *S. arachidis*.

Untersuchungen über den Einfluss von Elektrolyten und Nichtelektrolyten auf die Sporangienkeimung und die Differenzierung der Zoosporen bei *Phytophthora infestans* [Studies of the influence of electrolytes and non-electrolytes on sporangial germination and zoospore differentiation in *P. infestans*], E. KRÜGER (Arb. Biol. Reichsanst. Land u. Forstw., 23 (1940), No. 1, pp. 51-95, figs. 22).—Details are presented of tests regarding the susceptibility and permeability of the sporangia to cations of the alkali metals, alkaline earth metals, and heavy metals, to the anions of K salts, and to sugars, urea, and alcohols. Comparative studies of the behavior of various strains of *P. infestans* in the presence of some of the substances tested are also included, together with a general discussion of the results of the study and their significance as related to the control of late blight by sprays. There are 95 references.

Über die mutationsauslösende Wirkung von Kartoffelpassagen auf verschiedene nekrotische Stämme des X-Virus [The mutation-inducing effect of potato passages on different necrotic strains of the X-virus], E. KÖHLER (Zentbl. Bakt. [etc.], 2. Abt., 102 (1940), No. 4-6, pp. 100-110, figs. 4).—Four "necrotic" mosaic strains of the X-virus cultured on tobacco were inoculated into the leaves of potato plants. Only a small proportion of the daughter plants showed infection, but when the virus from those contracting the disease was transferred back to tobacco it was found to have changed. One of the virus strains developed 6 new mutants, differing in part quantitatively and in part qualitatively from one another. Potato passage of this strain thus changes in more than one direction. Another strain appeared unchanged after passage in 6 out of 25 daughter plants, the remaining daughter plants being virus-free. A third strain, although it increased actively in the inoculated potato leaves, failed to reach any of the 28 daughter tubers and was therefore not found in the daughter plants. It thus appears that under the experimental conditions a strain which was labile on tobacco assumed a greater stability when transferred to potato. On the contrary another strain very stable on tobacco became highly variable on passage through the potato plant.

Summary of the recorded data on the reaction of wild and cultivated grasses to stem rust (*Puccinia graminis*), leaf rust (*P. rubigo-vera*), stripe rust (*P. glumarum*), and crown rust (*P. coronata*) in the United States and Canada, G. W. FISCHER and M. N. LEVINE. (Coop. Minn. and Wash. Expt. Stas.). (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1941, Sup. 130, pp. 30).—During the past several decades many investigators have published data on the reactions of wild and cultivated grasses to the four most important rusts of the United States and Canada, but only a few have dealt with the grasses primarily. More recently there has been an increasing

interest in the grasses themselves, and it has seemed desirable to make the vast amount of data more easily available. The data are here summarized in tabular form, and the source material from which most of this information was obtained is listed in the bibliography (93 references). In table 1 a summary is presented of records pertaining to the known reactions of 350 species of native and introduced grasses to the 4 rusts named in the title, and in table 2 the results recorded in the literature or otherwise for the 6 varieties of stem rust found in North America.

Reactions of Napier grass, Merker grass, and their crosses to Helminthosporium eye spot, G. K. PARRIS and J. C. RIPPERTON. (Hawaii Expt. Sta.). (*Phytopathology*, 31 (1941), No. 9, p. 855).—Greenhouse inoculations and field observations are said to have confirmed previous experiences that certain crosses of Merker and Napier grasses are resistant to *H. sacchari*. The varying degrees of resistance of these crosses indicate resistance to be an inherited character.

Pathogenicity and control of Corticium fuciforme, L. E. ERWIN (*Rhode Island Sta. Bul.* 278 (1941), pp. 34, figs. 13).—*C. fuciforme* first caused serious injury to lawns, golf courses, and polo fields in Rhode Island in 1934. The symptoms are confined to the aerial portion of turf grasses. The fungus forms an effuse gelatinous layer, spreading over the leaves and stems, and sclerotia and additional gelatinous layers are formed as it extends out from each infection center, binding the leaves and stems together. Necrotic symptoms first appear at the point of infection, which may occur at any place on the leaf or leaf sheath. In the early stages infected tissues are water-soaked, later becoming dry, with loss of color. The turf is killed in areas 2–6 in. in diameter. In the greenhouse characteristic symptoms develop within 2 days after planting of mycelium or sclerotia. The cardinal points of temperature are 1°, 20°, and 25°–30° C. Greenhouse experiments at 18°–22° showed all commonly used turf grasses to be susceptible. In various field studies satisfactory control was secured by a number of fungicides. It was also demonstrated that on poor lawns or poor fairways nitrogenous fertilizers such as sulfate of ammonia or nitrate of soda would check the pathogen, best results being secured by applications in April or May.

The relation of the curculionid, Anacetrinus deplanatus, to root rot and basal stem rot of barnyard grass, Echinochloa crusgalli, E. W. HANSON and H. E. MILLIRON. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 9, pp. 832–837, figs. 3).—Barnyard grass is commonly attacked by this weevil, severe infestation enabling soil-borne fungi and bacteria to enter the stems and cause severe basal stem rot. The symptoms of both infestation and infection, as well as the various stages of the insect, are described. Microorganisms were isolated from 95 percent of the stems of infested as contrasted with 15 percent from noninfested plants, *Fusarium* spp. (including *F. culmorum* and *F. graminearum*) being most common. Several species of *Helminthosporium* (especially *H. sativum*) were found, and other organisms isolated were *Rhizoctonia solani*, species of *Alternaria*, *Aspergillus*, *Basisporium*, *Brachysporium*, *Cephalothecium*, *Chaetomium*, *Penicillium*, and *Stemphylium*, and at least three kinds of bacteria. The microflora from the insects was similar to that from infested plants. The importance of insect infestation in the development of basal stem rot and root rot of cereals and grasses is stressed.

Inoculation experiments with covered smut of barley, R. W. WOODWARD and D. C. TINGEY. (Utah Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 632–642).—Barley varietal reactions to *Ustilago hordei* and the factors influencing infection were studied over an 8-yr. period, using inocula with 85–95 percent viability. Inoculated with dry spores, seed

hulled with a smut dockage machine had no greater infection than unhulled seed. Hand-hulled seed gave poorer emergence but more infected plants among the survivors than H_2SO_4 -hulled or unhulled seed. Inoculation after hulling was more laborious and less effective than by the spore- or vacuum spore-suspension methods. Cutting back the culms in the early boot stage did not increase the amount of smut. Barley grown on soil of moderately low productivity had a higher infection than that on fertile soil. Depth or date of seeding, wetting of seed, and treatment of seed after inoculation showed but little consistent influence on infection. Soil inoculation gave very low infection. Though collected from widely scattered Utah localities, there was no evidence of more than one smut race in the collections used. Increasing the spore load over the ordinary amount failed to increase infection. Even when barley was sown under apparently similar conditions, infection varied greatly from year to year. Varieties differed in their reaction to this smut, Trebi and Winter Club—the common Utah varieties—being among the most susceptible and Velvon—a comparatively new but widely grown variety—proving highly resistant.

Studies on control of bunt of wheat, H. E. MORRIS and A. M. SCHLEHUBER (*Montana Sta. Bul. 393 (1941), pp. 18, figs. 4*).—The authors summarize studies of *Tilletia levis* conducted from 1928 to 1936. Factors influencing bunt development between seed germination and emergence are the presence of the fungus, soil temperature and moisture, and wheat varieties. Soil contamination results from wind-borne spores and bunt heads falling on the ground during harvesting. Soil contamination proved to be an important factor in bunt infection of winter wheat in Montana, and probably explains why seed treatment is not invariably effective. Evidence of the occurrence of several physiologic races of bunt in the State is presented. This complicates the breeding program, and especially since other races may be introduced. Tests on three wheat varieties indicated decreases in grain yield with increases in percentage of bunt. Certain varieties were found to be more subject to winter injury when infected with bunt. It is generally accepted that the production of bunt-resistant varieties, in combination with seed treatment, is the most effective means of combating this disease. Seed free from bunt (or nearly so) is an important factor in bunt control, as are also certain farm practices. Growth of the bunt and foot rot organisms, as well as of the wheat plant, are influenced by the temperature and moisture content of the soil, about 10° C. and a moisture content around optimum for plant growth being favorable for bunt development and infection. Seed treatment is deemed good insurance every year, usually resulting in increased stands, healthier plants, and higher yields. Recommended procedures are presented for copper carbonate, New Improved Ceresan, and basic copper sulfate. Copper sulfate and formaldehyde are not recommended for Montana.

Recommended practices for control of bunt in wheat, H. E. MORRIS and A. M. SCHLEHUBER (*Montana Sta. Cir. 163 (1941), pp. 4*).—Based on the above.

Zur physiologischen Spezialisierung des Weizenbraunrostes in Deutschland im Jahre 1938 [Physiological specialization of wheat leaf rust in Germany, 1938], K. HASSEBRAUK (*Arb. Biol. Reichsanst. Land u. Forstw., 23 (1940), No. 1, pp. 31-35*).—In samples of wheat leaf rust (*Puccinia triticina*) from 104 German varieties (1938), races 9, 10, 11, (13), 14, 15, 16, 17, 20, 25, 26, 31, 53, 58, 93, and 94 were identified. Most frequently encountered were races 20 (=13), 16, 14, 11, and 15.

Mit Hilfe neuer Testsorten durchgeführte Untersuchungen über die physiologische Spezialisierung von *Puccinia triticina* Erikss. [Studies of physiological specialization in wheat leaf rust (*P. triticina*) carried out

with the aid of new differential varieties], K. HASSEBRAUK (*Arb. Biol. Reichsanst. Land u. Forstw.*, 23 (1940), No. 1, pp. 37-50).

Ueber die Interferenzwirkung von Luftfeuchtigkeit und Temperatur auf das Zustandekommen der Infektion mit Uredosporen verschiedener Getreiderostarten [The effects of atmospheric moisture and temperature on the occurrence of infection with urediospores of various species of rust fungi], W. STRAIB (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 50 (1940), No. 11, pp. 529-552).—Data are presented for *Puccinia triticina*, *P. dispersa*, *P. coronata*, *P. graminis*, *P. glumarum*, and *P. simplex*.

Susceptibility of wheat varieties and selections to loose smut, S. A. WINGARD and F. D. FROMME (*Virginia Sta. Tech. Bul.* 70 (1941), pp. 26, figs. 4).—Though not the most important wheat disease, loose smut (*Ustilago tritici*) is said to cause annual losses of millions of dollars to this crop in the United States. Since the fungus is carried over within the seed the development of resistant varieties would seem the most practical means of control. Evidence presented from inoculation tests indicated that the striking difference in incidence of loose smut in the Leap and Stoner varieties was due to something fundamental in the constitution of the Leap variety rather than to mere disease escape. Comparative studies of the bearded and beardless groups indicated the latter to be slightly more resistant as a group than the bearded ones under spontaneous field infection conditions, but not necessarily so on artificial inoculation. Pure-line selections of the Fulcaster, Fultz, and Poole, as well as commercial varieties, were found to vary greatly in susceptibility. Although the reason for this variability of certain selections is not clearly shown, it is suggested that it may be due to their hybrid origin. Infected wheat grains are more shriveled than normal ones, have a lower germinability, and produce seedlings more susceptible to winterkilling. The last two factors may account for some of the apparent resistance of certain varieties. Some of the pure-line selections of Fulcaster, Fultz, and Poole varieties appear, however, to be highly resistant on exposure to spontaneous infection in the field, and the comparative reactions of many of them are presented. Among those proving highly resistant in field tests, it is noteworthy that several of the Fulcaster selections that are most resistant are also high yielding, and among them selection F-h-6 has been multiplied for limited distribution and possible introduction as a replacement for V. P. I. 131. There are 16 references.

Die Infektion des Weizens durch *Ophiobolus graminis* als Funktion der Temperatur [Wheat infection by *O. graminis* as a function of temperature], A. G. WINTER (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 50 (1940), No. 9, pp. 444-459, figs. 2).—Take-all infection, observed at 10°, 16°, and 22° C., progressed more rapidly the higher the temperature. The soil moisture content was also found to influence the effects of temperature fluctuations. The observed lowering of the temperature optimum in sterilized as compared with nonsterilized soils appears to be based not on the interference of antagonism against the parasitic phase of the fungus, but on the rapid destruction of the inoculum by the soil microflora. The influence of temperature on the "saprophytic" phase may accordingly be viewed as explained. With rise in temperature there appears to follow an enrichment of the inhibitory factors. The influence of temperature fluctuations on the rate of infection is greater as the soil moisture content becomes more favorable, and the effect of a change in water content of the soil is stronger the more the temperature accelerates the development of the parasite.

Meios de controle à "bacteriose" da mandioca [Means of controlling bacteriosis of cassava], J. S. BRANDÃO, JR. (*Bol. Min. Agr. [Brazil]*, 29 (1940), No. 7, pp. 11-15).

Identity and distribution of three rusts of corn, G. B. CUMMINS. (Ind. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 9, pp. 856-857, fig. 1).—*Puccinia polysora* is reported on corn and compared with *P. sorghi* and *Angiopsora zaeae*, together with their respective distributions.

Notes au sujet de la culture du coton dans le Congo-Ubangi.—III, Marasmius sp., nouveau parasite du cotonnier dans le District du Congo-Ubangi [Notes on the culture of cotton in the Congo-Ubangi.—III, Marasmius sp., a new parasite of cotton in this district], C. LEONTOVITCH and H. DE SAEGER (*Bul. Agr. Congo Belge*, 31 (1940), No. 1-4, pp. 125, 137-143, figs. 3; *Dutch abs.*, pp. 142-143).

Varietal susceptibility of peanuts to black spot (*Cercospora personata* (B. & C.) Ell. & Ev.), G. M. REYES and R. ROMASANTA (*Philippine Jour. Agr.*, 11 (1940), No. 4, pp. 371-381, pls. 5, fig. 1).—This is said to be one of the most destructive diseases of peanuts in the Philippines. Following a historical review, field observations are presented on the prevalence of the disease and the reactions of different varieties, defoliation due to infection, infection of vines and pegs, and the possibility of control by varietal resistance. Tests of 13 varieties indicated Taitau, Georgia Red, Valencia, San José No. 3, and Tirik to possess the highest resistance, in the order named. It seems probable that by introduction of varieties or by breeding and selection, strains possessing resistance and other desirable economic characters can eventually be developed.

Zur Frage des serologischen Nachweises von Kartoffelviren [The serological demonstration of potato viruses], C. STAPP and R. BERCKS (*Arb. Biol. Reichsanst. Land u. Forstw.*, 23 (1940), No. 1, pp. 21-30).—Strains of the potato X-virus cultured on tobacco were identified by the precipitin and agglutination methods. The X-virus was serologically differentiated into the two groups "mottle" and "ring spot." Agglutination of the clear press sap from diseased tobacco plants could be obtained by the aid of chloroplast or blood corpuscle substance in the presence of antiserum. An agglutination method is presented for demonstrating X-virus in potato tubers. Potato Y-virus was identified in tobacco plants by the agglutination method, but the A-virus was not serologically demonstrable. The latter is thus not identical with the Y-virus. There are 29 references.

A masked virus of Aucklander Short-top potatoes, E. E. CHAMBERLAIN (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 2A, pp. 57A-71A, figs. 8).—Certain potato varieties grown adjacent to the Aucklander Short-top variety developed the following year a considerable percentage of plants showing top necrosis. Plants of this variety were found to carry frequently in masked form a virus capable of causing this disease in susceptible varieties, the symptoms of which are described. Infection was either by grafting or juice inoculation, but attempts at transfer by the aphids *Myzus persicae* or *Macrosiphum solani* have thus far failed. The disease was experimentally transmitted to six solanaceous species, and the symptoms on each are described. On available information it has not been possible to correlate the virus with any hitherto known on potatoes. Control measures are discussed.

"Leak," a watery wound-rot of potatoes in New Zealand, R. M. BRIEN (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 4A, pp. 228A-231A, figs. 2).—This tuber rot, observed in New Zealand for a number of years, was first identified in 1934. It is characterized by a brown discoloration of the tubers and internally by a rapid rotting followed by exudation of a watery fluid. *Pythium ultimum* has been identified as the cause, its morphology is described, and successful inoculations are reported. The disease may cause serious losses in stored tubers during summer, particularly at 20°-30° C. (68°-86° F.) Control meas-

ures consist in care against injuring the tubers, storage in a cool, dry, well-ventilated place, and keeping the sacks dry.

Zellphysiologische und anatomische Untersuchungen über die Reaktion der Kartoffelknolle auf den Angriff der *Phytophthora infestans* bei Sorten verschiedener Resistenz [Cell physiological and anatomical studies of the reaction of potato tubers to attack by *P. infestans* in varieties differing in resistance], G. MEYER (*Arb. Biol. Reichsanst. Land u. Forstw.*, 23 (1940), No. 1, pp. 97-132, pl. 1, figs. 5).—A monographic study, with 86 references.

Some relations between mercuric chloride content, acid content, and fungicidal efficiency of certain solutions as used for potato-tuber disinfection, B. E. PLUMMER, JR., and R. BONDE. (Maine Expt. Sta.). (*Phytopathology*, 31 (1941), No. 9, pp. 812-817).—The results of laboratory and field experiments confirmed the conclusion of other investigators that the amount of $HgCl_2$ in a solution is rapidly weakened by successive 90-min. treatments unless acidulated. By acidulation the solution proved effective for 25 instead of only 5-6 successive treatments. The reduction of $HgCl_2$ in the acid solution was not affected by use of hard water in place of distilled water as a solvent. Acidulation reduced the turbidity of the treating solution. The results indicate that $HgCl_2$ solutions intended for seed potato disinfection should be acidulated, preferably with acetic acid.

Las enfermedades del arroz y su importancia económica en el Valle del Cauca [The diseases of rice and their economic importance in the Cauca Valley, Colombia], A. BERNAL CORREA (*Rev. Facult. Nac. Agron. [Colombia]*, 3 (1940), No. 8-9, pp. 820-850).—

Estudio sobre un daño fungoso del ajonjolí en Costa Rica [Studies of a fungus parasite of sesame in Costa Rica], R. MÉNDEZ (*D. N. A. Rev. Dept. Nac. Agr. Costa Rica*, 5 (1940), No. 9-12, pp. 426-432, fig. 1).—The author discusses the various fungi associated and concludes that *Alternaria solani* is the principal cause of the injury encountered. Recommendations for control are given.

On *Christisonia wightii* Elmer, a parasite of sugarcane, E. QUISUMBING (*Philippine Jour. Agr.*, 11 (1940), No. 4, pp. 397-401, pls. 2).—*C. wightii*, said to be the only representative of this genus of the Orobanchaceae reported from the Philippines, was found parasitizing sugarcane, causing a yellowing of the leaves followed by death of the host plant through drying. The original description of the species and additional notes by the author are presented.

Diseases of taro in Hawaii and their control, with notes on field production, G. K. PARRIS (*Hawaii Sta. Cir.* 18 (1941), p. 29, figs. 5).—Root and corm diseases, occurring chiefly on wet land, are best controlled by thoroughly plowing and drying the soil and not planting taro for 6-12 mo., during which period the land can be adapted to truck crops. Chemical treatments of the soil have not given any consistent beneficial action, though 2-4 tons per acre of lime has been used by some growers with good results. Leaf diseases are controlled by spraying with a copper fungicide at 10- to 20-day intervals from the time the disease first appears. Sprayed wet-land plants have yielded 10-30 percent more than unsprayed plants, but no data have been obtained on spraying upland taro. Leaf diseases on wet land may also be directly controlled by increasing the interplant spacing from the present 16 or 18 in. to 30 in., though in the latter case harvesting becomes more difficult because of the more extensive root systems. Taro is very susceptible to unfavorable growing conditions, and brief notes on handling of the land and irrigation water are presented. Methods of planting, selection of planting material, and fertilization are also discussed.

Blackfire of dark tobacco in Kentucky, E. M. JOHNSON, W. D. VALLEAU, and S. DIACHUN. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans.*, 8 (1938-39), p. 35).—An abstract.

A "faixa das nervuras," uma doença de virus do fumo encontrada no Estado de São Paulo (A virus disease of tobacco named "faixa das nervuras," found in the State of São Paulo), M. KRAMER and K. SILBERSCHMIDT (*Arq. Inst. Biol. [São Paulo]*, 11 (1940), pp. 165-188, pls. 3; *Eng. abs.*, pp. 185-186).—In an experimental plat seven plants were found exhibiting a pale chlorotic mottling of the leaves. In sap inoculations from these plants the virus produced veinbanding on tobacco of the varieties Havana, White Burley, Kentucky, Sumatra, Samsun, and Amarelo Rio Grande; faint mottling on *Nicotiana langsdorffii*; mottling and short veinbanding on *N. rustica*; negative results on *N. glutinosa* and *Datura stramonium*; and negative or doubtful results on *Solanum nodiflorum* and *Petunia hybrida*. The virus was transmitted by sap and grafting to four varieties of potato. The virus is placed in the potato Y group, and its characteristics are said to be very similar to those of the veinbanding virus of American authors.

Effect of tobacco mosaic on yield and quality of dark fire-cured tobacco, E. M. JOHNSON and W. D. VALLEAU (*Kentucky Sta. Bul.* 415 (1941), pp. 109-114).—Based on 3 years' results, tobacco mosaic introduced so as to give 100 percent infection of plants 3 weeks after setting reduced the yield of dark fire-cured tobacco 31 percent and the total value 48 percent. Introduced at topping, mosaic reduced the yield only 6.3 percent, but the value 25.8 percent. Cured leaves from mosaicked plats were 1-4 grades lower than those from the mosaic-free plat, being smaller, thinner, and less desirable in color than normal tobacco. Losses from mosaic on farms, where 20 percent infection prior to topping is not unusual, probably are comparable to losses in the experimental plats where infection was introduced at topping.

Bestrijding van mozaïekziekte bij tabak met looistofhoudende oplosingen (Control of tobacco mosaic with extracts of tanning substances), D. A. VAN SCHREVEN (*Landbouw [Buitenzorg]*, 17 (1941), No. 4, pp. 222-230, pl. 1; *Eng. abs.*, pp. 229-230).—Hands rinsed in undiluted filter paper-filtered juice from mosaicked leaves were successfully disinfected by washing in 1.5-8 percent solutions of tannic acid made from galls on *Rhus semialata* or in a 0.5 percent solution of a commercial tanning material. The virus was also inactivated by tanning extracts (made from the bark of *Acacia decurrens*) used in tanning leather. When a tanning solution is to be used over a long period it is necessary to add a suitable fungicide to prevent development of micro-organisms which might destroy its inactivating capacity. With tobacco grown in a virus-contaminated soil a large proportion of the plants contracted mosaic, but it was found possible to disinfect the soil with tanning extracts. The tanning extracts not only inactivated the virus of ordinary mosaic but also the viruses of all sap-inoculable tobacco virus diseases tested, viz, white mosaic, distorting mosaic I, severe mosaic, ring spot necrosis, Holmes' distorting mosaic, Holmes' masked strain, mild mosaic, tobacco ring mosaic, and mosaic VI B. There are 22 references.

Isometric crystals produced by *Pisum virus 2* and *Phaseolus virus 2*, F. P. McWHORTER. (Oreg. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 31 (1941), No. 8, pp. 760-761, fig. 1).—The trypan blue technic demonstrated in *Vicia faba* infected with *Pisum virus 2* and *Phaseolus virus 2* crystalline inclusions (0.3-4 μ in diameter and plainly isometric) that are of unusual interest because they occur in both cytoplasm and nuclei of infected host cells. That these crystals are related to the causal agents is proved by the fact that they have been demonstrated in four species of legumes inoculated with the first and in two species inoculated with the second virus. Though common in virus-infected animal cells, the presence of inclusions within the nuclei has hitherto

been proved for only one other case in plants, viz, for tobacco infected with *Nicotiana virus 7*, which the evidence suggests may be related to the viruses here studied.

Recent developments in the control of vegetable diseases with special reference to greenhouse culture, K. J. KADOW. (Univ. Del.). (*Veg. Growers Assoc. Amer. Ann. Rpt.*, 1938, pp. 77-87).

"Foot-rot" of tomatoes caused by *Phytophthora cryptogea*, R. M. BRIEN (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 4A, pp. 232A-236A, figs. 2).—This disease, first observed in New Zealand in 1938, was found due to *P. cryptogea*. The symptoms, history of the disease, and factors favoring infection are discussed. Typical cases developed both from incision and soil inoculations. Control measures are suggested.

Severe-streak of tomatoes: A composite virus disease occurring in New Zealand, E. E. CHAMBERLAIN (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 4A, pp. 181A-186A, figs. 3).—This disease, originally described as "severe tomato mosaic," is shown to be due to a combination of tobacco mosaic and a necrotic virus, and methods are given for separating the two components. The symptoms on tomato are described, and a table of comparative symptoms is included to differentiate this from other tomato virus diseases in New Zealand. The name "severe streak" is proposed to differentiate it from common tomato streak, which is prevalent throughout the Dominion. The incidence and importance of the malady are discussed, it is shown to be readily transmitted mechanically, and control measures are indicated.

Tomato necrosis: A component of severe-streak of tomatoes, E. E. CHAMBERLAIN (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 4A, pp. 186A-197A, figs. 5).—This necrotic virus, which combined with tobacco mosaic causes severe streak, was separated from the combination by passage through the tree-tomato and is designated "tomato necrosis." The symptoms on tomato and other thus-far-known hosts (11 Solanaceae) are described. The virus was readily transmitted artificially, but trials with the aphid *Myzus persicae* failed. Both tobacco and tree-tomato appeared to cause a gradual loss of infectivity. The virus survived over 17 weeks in vitro and had a dilution end point of 1: 500,000 and a thermal death point of 64°-66° C. It has not been identified with any previously described virus.

Diseases of fruit trees caused by leaf-rust, manganese and zinc deficiencies, and their joint control, B. J. DIPPENAAR (*So. African Jour. Sci.*, 37 (1940), pp. 136-155, figs. 7).—The three stone fruit diseases in the western Cape Province primarily responsible for a decline in tree vigor, low yields, and loss of trees are said to be leaf rust (*Puccinia pruni-spinosae*), little-leaf, and mottle leaf, the last two being due, respectively to Zn and Mn deficiencies. It was experimentally shown that for controlling Zn deficiency in peaches a late spring treatment with zinc-lime is far superior to dormant sprays of ZnSO₄ alone, but on plums a dormant spray proved superior to a spring application. Rapid and lasting control of Mn-deficiency mottle leaf was effected by spraying with Mn-containing compounds. For controlling leaf rust on nectarine trees late in summer, zinc-lime sprays proved as effective as bordeaux mixture, but permanganate of potash plus hydrated lime was slightly less effective than either.

Fire blight of apples—why it occurs and what to do about it, C. J. ELDE (*Minn. Univ. Agr. Ext. Folder 71* (1939), pp. [4], figs. 2).

Diurnal cycle of ascus maturation of *Taphrina deformans*, C. E. YARWOOD. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 5, pp. 355-357, figs. 2).—These studies demonstrated a diurnal cycle of the leaf curl fungus on peach trees in a natural environment. The asci start growth from ascogenous cells

in the evening, nuclear divisions occur at night, and spores mature the following day. Ascospores are spontaneously discharged in largest numbers about 8 p. m., which is several hours after they appear morphologically mature. The discharge is stimulated by vapors of formalin-acetic-alcohol acid fixative, but even under this stimulus they are not subject to discharge until after they are apparently mature morphologically.

O deprecimento e o resurgimento da cultura do marmelo [The decline and revival of quince culture], R. D. GONÇALVES (*Rev. Soc. Rural Brasil.*, 20 (1940), No. 241, pp. 36-39, figs. 11).—A general discussion of quince culture, with special reference to leaf blight due to *Fabraea maculata* and its control.

Stunt disease of strawberry, S. M. ZELLER and L. E. WEAVER. (Oreg. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 9, pp. 849-851, fig. 1).—A new strawberry virus causing stunting of plants and cupping of the leaves without appreciable chlorophyll reduction was transmitted by grafting and by the strawberry leaf aphid (*Capitophorus fragaefolii*). The common name "stunt" is proposed for the disease. The virus is referred to as "Fragaria virus 5," and for those desiring a name of the Holmes type *Nanus cupuliformans* is suggested.

Occurrence, pathogenicity, and temperature relations of Phytophthora species on citrus in Brazil and other South American countries, H. S. FAWCETT and A. A. BITANCOURT. (Calif. Citrus Expt. Sta. et al.). (*Arq. Inst. Biol.* [São Paulo], 11 (1940), pp. 107-118, pls. 3; *Port. abs.*, pp. 116-117).—Five species of this genus (*P. citrophthora*, *P. parasitica*, *P. cactorum*, *P. palmivora*, and *P. cinnamomi*) have been isolated and identified from citrus in South America.

Periodicidad estacional de la enfermedad de la hoja del café (Hemileia vastatrix) [Seasonal periodicity of the rust of coffee leaves due to *H. vastatrix*], W. W. MAYNE (*Rev. Inst. Defensa Café Costa Rica*, 10 (1940), No. 74, pp. 359-370, figs. 4).—A study of the effects of climatic conditions on the development of this disease and on its control.

Extenuación perniciosa en el cafeto (paloteo pernicioso, anemia perniciosa, die back) [Dieback of coffee], V. WELLBORN (*Café el Salvador*, 10 (1940), No. 120, pp. 817-823, figs. 3).—The author concludes that the disease is due to deficiencies in nutritive materials, and recommends green manuring to counteract the lack of organic materials, supplying sufficient shade in the coffee plantation, and protecting against high winds to avoid sudden changes in temperature.

Calcium deficiency as a factor in abnormal rooting of Philodendron cuttings, C. M. TUCKER and P. R. BURKHOLDER. (Univ. Mo. et al.). (*Phytopathology*, 31 (1941), No. 9, pp. 844-848, figs. 2).—Abnormal development of *Philodendron* cuttings in the greenhouse resulted from failure to produce effective root systems. Abnormal rooted cuttings placed in controlled sand cultures receiving a complete nutrient solution or one lacking either N, Ca, S, Mg, K, or P recovered and developed good root systems, but abnormal rooted cuttings transferred to sand cultures and supplied with a minus-Ca solution showed no improvement over their original condition. Fresh, healthy cuttings placed in minus-Ca cultures developed typical brown, stunted root systems. Under low-nutrient conditions, maintenance of fairly high moisture in closed vessels promoted better development of roots than with open bottom drainage.

Current-season development of virus symptoms in tulips, P. BRIERLEY. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 9, pp. 838-843, fig. 1).—Tulips inoculated in early stages of growth by the carborundum method with cucumber virus 1, tulip viruses 1 and 2, or the latent virus of lily, developed current-season symptoms. This method is efficient and more convenient than methods

previously used, but the success is attributed to inoculation at an early stage of growth.

Uma variedade de *Septobasidium castaneum* Burt [A variety of *S. castaneum*], A. P. VIÉGAS (*Inst. Agron. Estado [São Paulo], Campinas, Bol. Téc. 73 (1940), pp. 7, pls. 6*).—*S. castaneum draconianum* n. var. is described as attacking the living trunks and branches of *Croton urucurana* and *Inga* sp.

A study of the *Cercospora* leaf-spot of tung oil tree, S. H. OU (*Sinensia, 11 (1940), No. 3-4, pp. 175-188, figs. 9; Chin. abs., p. 188*).—*C. aleuritidis*, causing leaf spot of tung oil trees, is found to be the conidial stage of a *Mycosphaerella* here described as *M. aleuritidis* n. comb. The disease was found prevalent in Szechwan. The conidial stage is formed on living leaves, whereas spermatogonia and perithecia are produced on fallen leaves.

Control of damping-off of broadleaf seedlings, E. WRIGHT. (U. S. D. A. and Univ. Nebr.). (*Phytopathology, 31 (1941), No. 9, pp. 857-858*).—*Rhizoctonia solani* and *Pythium ultimum* were found to be the principal fungi causing damping-off of broadleaf seedlings in nurseries of the Great Plains area. Better control was given by such cereals as corn, wheat, and oats, grown as preceding crops, than by legumes such as sweetclover or alfalfa. For best results, preceding crops should be turned under at least 1 mo. before the broadleaf seeds are sown. Damping-off increased directly with the amount of nitrate N in the soil as determined by the phenoldisulfonic acid test. In field tests, application of glucose to a sandy loam soil at the time of sowing decreased the nitrate N and effectively controlled damping-off of *Ulmus americana*, but the same treatment in silt loam was less effective. Greenhouse tests with several broadleaf species gave similar results.

Variation in culture of several isolates of *Armillaria mellea* from western white pine, V. L. BENTON and J. EHRLICH. (Univ. Idaho). (*Phytopathology, 31 (1941), No. 9, pp. 803-811, figs. 5*).—In studies of cultures of *A. mellea* from diseased roots of *Pinus monticola*, five experiments were performed in which appearance in culture and rhizomorph production, diameter of mycelial growth, degree of saprogenicity, and response to differences in wood-moisture content, temperature, and pH were determined. The results indicated wide variations in cultural characteristics and response among certain of the tested isolates, and approximately 150 percent or slightly higher initial wood-moisture content (initial oven-dry basis), 21°-25° C. for growth on malt agar at pH 5, and pH 4.5-5.5 for growth on malt agar at 25° were determined as optimum values.

The growth rate of several wood-inhabiting fungi, A. E. EDGECOMBE (*Phytopathology, 31 (1941), No. 9, pp. 825-831, fig. 1*).—Plate cultures of *Collybia velutipes*, *Pleurotus ostreatus*, *P. ulmarius*, *Merulius lacrymans*, *Pholiota adiposa*, and *Armillaria mellea* on fruit-enriched media under uniform moisture, light intensity, temperature, and pH gave varying daily growth increments. For example, *C. velutipes* gave a daily increase of 8 mm., whereas under similar optimum conditions, *A. mellea* gave only 1.2 mm.

Some hyphomycetes parasitic on free-living terricolous nematodes, C. DRECHSLER. (U. S. D. A.). (*Phytopathology, 31 (1941), No. 9, pp. 773-802, figs. 7*).—Ten new hyphomycete species were found to parasitize nematodes multiplying in agar plate cultures receiving accessions of leaf mold or other decaying plant materials after occupation by fungus mycelium. Since two of these parasites form clamp connections in their conidiiferous hyphae, they are described under a new mucedinaceous genus (*Nematoctonus*) which presumably has its sexual stage in the basidiomycetes. *N. tylosporus* n. sp. destroyed *Bunonema* sp. in leaf mold from Maryland, District of Columbia, and Virginia, and *N. leiosporus* n. sp. destroyed *Plectus* sp., *Rhabditis* sp., and *Wilsonema* sp.

in leaf mold from Wisconsin. A third member of this genus, predaceous rather than parasitic, is reported to destroy nematodes in pineapple roots in Hawaii. Four evidently interrelated parasites (*Acrostalagmus bactrosporus* n. sp. destructive to *Plectus parvus* in leaf mold from Virginia and Maryland, *A. obovatus* n. sp. destructive to *P. parvus* in decaying stems of *Ambrosia trifida* from Virginia, *Cephalosporium balanoides* n. sp. destructive to *P. parvus* and *Acroboloides bütschlii* in leaf mold from Wisconsin, and *Spicaria coccospora* n. sp. destructive to *P. parvus* in leaf mold from Wisconsin) are probably closely related to insect parasites in the same genera. Of more uncertain kinship is *Meria coniospora* n. sp. in leaf mold from Wisconsin and Virginia, which destroys more especially nematodes of the genus *Rhabditis*. Three very distinctive species are described as congeners of *Harposporium anguillulae*, viz, *H. helicoides* n. sp. destructive to *Rhabditis* spp. in leaf mold from Maryland and Virginia, *H. oxyracum* n. sp. destructive to species of *Plectus*, *Wilsonema* and *Bunonema* in leaf mold from Wisconsin, and *H. diceracum* n. sp. destructive to *P. parvus* in decaying leaves and stems of *Poa pratensis* from Virginia. There are 44 references.

On the specific status of the so-called biological strains of *Heterodera schachtii* Schmidt, M. T. FRANKLIN (*Jour. Helminthol.*, 18 (1940), No. 4, pp. 193-208, pl. 1, figs. 9). The author concludes from this study that since the differences among the races of *Heterodera* have been shown to be fundamental, it seems reasonable to assume that each species will probably confine its attacks fairly constantly to its own host range. Though the host ranges of two or more species may overlap, as with *H. punctata* and *H. major*, both of which parasitize cereals, it would appear unlikely that a species would within 2-3 yr. become adapted to the normal host of another species. There is thus less risk of "oats-sick" land becoming dangerous to mangolds than one would expect if a biological strain only were involved. There remain several strains of *Heterodera* which cannot yet be assigned to any of the species discussed, since their morphology is too little known. It is possible that among these races, such as that described from sea maram grass (*Anmophila arundinacea*), forms will be found which differ from any of the species thus far known, and other species will have to be made. Now that the differences between the spicules have been discovered, it is hoped that when new hosts are found it will be possible to identify the species with certainty. In addition to the forms noted, *H. schachtii*, *H. rostochiensis*, *H. göttingiana*, *H. major*, and strains on peas, beets, curled dock (*Rumex crispus*), and potatoes are discussed.

Methods for the recovery and counting of cysts of *Heterodera schachtii* from soil, D. W. FENWICK (*Jour. Helminthol.*, 18 (1940), No. 4, pp. 155-172, pls. 2, figs. 3).—The method described for recovering cysts from soils of not more than 10 percent water content is continuous, and the yield from it is said to be only slightly lower than that from the dry flotation of soil. The yield contained slightly less full cysts than by the latter method, but this drop was not considered sufficiently great to justify drying large quantities of soil. Amounts of soil around 100 lb. can be handled continuously in a matter of 2 hr. A new method of recovering cysts from the float is also described, involving soaking of the float and recovery of the cysts therefrom by differential flotation. It was found possible to modify the method of counting cysts, the optimum sample proving to be 0.5 lb. Using such samples, results of a known standard (standards given in text) of accuracy may be obtained. A new type of cyst counting slide is also described.

Soil treatments with volatile liquids for control of nematodes, B. G. CHITWOOD (*Phytopathology*, 31 (1941), No. 9, pp. 818-824, fig. 1).—Of several chemicals tested for controlling nematodes in soil, chloropicrin, ethylene chloride, and mixtures of the two produced the best results. For *Ditylenchus dipsaci* in sandy loam later planted to narcissus, 10-cc injections of ethylene chloride into 6- to 8-in. holes 10.5 in. apart and rows 9 in. apart proved most satisfactory (although inflammable). For *Heterodera marioni* and fungi in sandy loam fields later planted to tomatoes, a chloropicrin-ethylene chloride mixture (1.5-8.5 cc.) gave best results from the standpoint of yields, but 10-cc. injections of ethylene chloride alone was as good or better for nematode control.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Suggestions on management of small game in Oregon, A. S. EINARSEN (*Oregon Sta. Cir.* 140 (1941), pp. 18, figs. 3).—Practical suggestions on small game management in Oregon include selection of the area, management of game fowl, aiding game in winter, predators, protection, food and water supply, and management of duck ponds and marshes.

Reproduction of the field mouse (*Microtus pennsylvanicus* (Ord)), W. J. HAMILTON, JR. ([*New York*] *Cornell Sta. Mem.* 237 (1941), pp. 23, figs. 9).—Report is made of a study of the reproductive behavior of the field mouse, one of the most widespread of the many species and potentially of great economic significance. The work reported is based largely on field mice taken in or near Ithaca, data having been obtained on the reproductive behavior of these mice over a period of 10 yr., although the majority of the more than 4,000 animals examined in the flesh were collected from 1934 to 1939. A list of 13 references to the literature is included.

A fruit tree coating effective against cottontails, H. A. CARDINELL, W. TOENJES, and D. W. HAYNE (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 65-68, figs. 2).—A continuation of work first reported upon by Neilson in 1933 (*E. S. R.*, 70, p. 801). Since 1937 more than 200 materials or mixtures have been tested as repellents for cottontail rabbits, and a few of the most promising further tested for their effect upon the growth of young trees. Of these, the only effective repellent that proved safe for use on seedlings of apple, peach, pear, Myrobalan plum, and Mazzard and Mahaleb cherry, as well as effective against cottontails, is a formula consisting of rosin and ethyl alcohol. In these trials the trees treated with the rosin-linseed oil formula recommended by Neilson showed positive evidence of restricted growth. Field tests have shown that 1 gal. of the repellent will be sufficient to treat about 150 to 200 2-year-old nursery trees, the exact number depending on the height of treatment and size of tree. It was found that a man could coat about 35 4-year-old apple trees in an hour.

Ponds for wildlife, P. F. ALLAN and C. N. DAVIS (*U. S. Dept. Agr., Farmers' Bul.* 1879 (1941), pp. II+46, figs. 29).—This practical account has been prepared to show how farmers and ranchers may protect their ponds from sedimentation, soil erosion, and water loss through the use of vegetation suitable as food and shelter for wildlife and to give some information on the management of wildlife in farm ponds and the land immediately adjacent.

Fish ponds, like crops, respond to fertilization, R. E. HUTCHINS (*Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 6, pp. 1, 2).—It is pointed out that experiments conducted in the South have shown fertilized fish ponds to produce as high as 400 percent more fish than unfertilized ponds. While nearly any common commercial fertilizer will help a pond, the recommendations made include (1) a mixture of 50 lb. of superphosphate and 300 lb. of cottonseed meal, or (2) of

40 lb. of sulfate of ammonia, 60 lb. of superphosphate, 5 lb. of muriate of potash, and 15 lb. of finely ground limestone, either of which is sufficient for 1 acre of water at each application. The first application should be made in the early spring, preferably after danger of floods is past. The water should become green or brown within a few days after such application, from the growth of plants that furnish food for the microscopic animal life upon which the insect fish food develops. Additional applications should be made about a month apart or whenever the water becomes clear, indicating the absence of plants. The application is best made by casting the fertilizer into the water around the edges, or by scattering it from a boat, in the shallow water. The cost has been shown to range from 5 to 6 ct. per pound of game fish produced to fertilize a pond.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 571, 575, 583-590, 595-596, figs. 3).—Contributions presented (E. S. R., 86, p. 784) are: A Host Plant Record for the Weevil *Peritelopsis globiventris* (Lec.), by W. H. Lange, Jr. (p. 571); Another Infestation of a School Building by *Oeciacus vicarius* Horvath, by H. B. Mills and D. J. Pletsch (p. 575) (Mont. Expt. Sta. coop. U. S. D. A.); "Poison" or "Insecticide" in Economic Entomology, by S. Marcovitch (pp. 583-584) (Tenn. Sta.); Color Preference of the Pea Aphid in Western Oregon, by C. E. Cody (p. 584); California Gull [*Larus californicus*] and Insect Control in Utah, by G. F. Knowlton (pp. 584-585) (Utah Sta.); An Aphid [*Macrosiphum macrosiphum* (Wilson)] Attacking Pears in the Pacific Northwest, by L. Childs (p. 585) (Mont. Sta.); The Pacific Drain Fly [*Psychoda pacifica* Kinkaid] in Homes, by A. Mallis and R. J. Pence (pp. 586-587) (Univ. Calif.); *Brachyrhinus sulcatus* Fab. in Southern California, by D. B. Scott, Jr. (p. 587); Cotton Aphid Multiplication Following Treatment With Calcium Arsenate, by E. W. Dunnam and J. C. Clark (pp. 587-588), and *Eucordylea huntella* Keifer as a Pest of Rhododendron [*Rhododendron californicum* in Oregon], by C. F. Doucette (pp. 588-589) (both U. S. D. A.); The Effect of Tillage on [the Lesser Migratory] Grasshopper Eggs, by H. B. Mills (p. 589) (Mont. Sta.); Control Studies of the Woolly Apple Aphid, by C. F. Smith (p. 590) (N. C. Sta.); Two Little Known Scale Insects [*Lecanium kunoensis* Kuwana and *Chionaspis etrusca* Leonardi], by E. O. Essig (p. 590) (Univ. Calif.); *Trichogramma* and the Oriental Fruit Moth, by C. F. Smith (p. 590) (N. C. Sta.); and Bibliography of Entomological Publications of Charles William Woodworth, by E. O. Essig (pp. 595-596) (Univ. Calif.).

Connecticut State entomologist, fortieth report, 1940, R. B. FRIEND. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 445 (1941), pp. 289-334, figs. 6).—An account of the insect record for the year (pp. 295-297) and a brief reference to and program of the annual conference of the Connecticut entomologists held in December (E. S. R., 83, p. 651) are followed by reports on inspection of nurseries (pp. 299-308) and of apiaries (pp. 310-313) and on Japanese beetle quarantine activities (pp. 308-310), all by M. P. Zappe, the gypsy moth, 1939-40, by Friend, J. T. Ashworth, and O. B. Cooke (pp. 313-321), mosquito control, by R. C. Botsford (pp. 322-324), and on parasite work, by P. Garman, J. C. Schread, W. T. Brigham, and G. R. Smith (pp. 328-333).

Accounts are given of the Dutch elm disease, by Zappe (p. 322); rodent control, by H. A. Merrill (pp. 324-328); continued study of stickers for spray materials, by Garman and C. E. Shepard (pp. 333-336); experimental control of the oriental fruit moth (pp. 336-339), the apple maggot (pp. 339-346), and the codling moth (pp. 347-348), all by Garman; observations on the European corn borer, by R. L. Beard (pp. 348-356); European corn borer insecticide investigations (pp. 357-361) and control of the cabbage maggot (pp. 361-363), both by

N. Turner; seasonal development of the Japanese beetle and spraying for the adult insect (pp. 363-367), the black vine weevil and its control (pp. 367-370), control of the hairy chinch bug (pp. 372-373), and the European earwig (pp. 375-376), all by J. P. Johnson; the control of mound-building ants, by Johnson and Friend (pp. 370-372); and chemical repellents to bark beetle breeding, by P. Wallace (pp. 374-375).

Miscellaneous insect notes presented (pp. 376-380) deal with a European saw-fly (*Gilpinia frutetorum* L.), a Japanese weevil (*Calomycterus setarius* Roelofs), clover mites, house crickets, a hemlock looper (*Ellopiia athasaria* Walk.), and a spider (*Mastophora cornigera* (Hentz)).

[Insect investigations of the New Haven Station]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 446 (1941), pp. 406-411, 412-414, 433).—A progress report (E. S. R., 84, p. 494) which includes information on control of the European corn borer, imported cabbageworm, cabbage looper, cabbage maggot, wireworms, onion thrips, squash vine borer, oriental fruit moth, orchard insecticides, Japanese beetle, gypsy moth, elm bark beetles, chinch bugs, black vine weevil, termite control, and at the Tobacco Substation control of the potato flea beetle, tobacco thrips, and wireworms.

Contributions of the entomologists to Hawaii's welfare, C. E. PEMBERTON (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 2, pp. 107-119).—The economic and aesthetic benefits that have resulted from the introduction and establishment of insect parasites and predators in the biological control of insect pests, particularly in Hawaii, are reviewed. Some of the more important biological control problems of the islands awaiting solution are noted.

[Investigations in economic zoology and entomology by the Indiana Station]. (Partly coop. U. S. D. A. et al.). (*Indiana Sta. Rpt.* 1940, pp. 12, 52-61, 69, 78, 78-79, figs. 3).—Progress (E. S. R., 84, p. 212) on the following investigations by O. W. Ford, G. E. Marshall, D. L. Johnson, G. A. Ficht, T. E. Henton, W. B. Cartwright, D. W. LaHue, E. V. Walter, C. Benton, G. E. Gould, J. J. Davis, N. F. Childers, F. P. Zscheile, L. F. Steiner, J. E. Fahey, J. C. Kase, and C. L. Burkholder is noted: Codling moth control; European corn borer and its possible control by the use of electric traps; grasshopper baits; hessian fly; corn earworm; chinch bug; gladiolus thrips control; tomato root nematode; potato insects; striped cucumber beetle; studies of codling moth sprays and spray residues; oriental fruit moth control and studies of its parasites; the influence of leafhoppers on the assimilation of plant food in apples and grapes; dusting v. spraying of apples; codling moth control and its relation to apple spray schedules and harvest residues; the production of game and furbearers on Indiana farms; and the propagation and field testing of plants valuable for wildlife utilization.

[Insect investigations of the Nebraska Station] (*Nebraska Sta. Rpt.* [1940], pp. 33-36, fig. 1).—This progress report (E. S. R., 83, p. 796) contains notes on grasshopper control, chinch bugs, hessian fly, and potato insect control in western Nebraska.

[Insect studies of the North Carolina Station] (*North Carolina Sta. [Bien.] Rpt.* 1939-40, pp. 12, 15-16, 33, 41, 42).—A progress report (E. S. R., 82, p. 72) which includes information on presquare mopping experiments to control the boll-weevil, corn borer and peach tree borer control, and relation of blooming time of dogwood to control of the cabbage maggot.

[Entomological investigations by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt.* 1940, pp. 24-27, 30-32, 38-39).—A progress report (E. S. R., 83, p. 651) which mentions maintaining a supply of the vedalia, a

specific predator on the cottony-cushion scale, by G. W. Wolcott, F. Señ, and L. F. Martorell; resistance of material to the dry-wood termite *Cryptotermes brevis* Walk., rearing large numbers of caterpillars of the sugarcane borer as hosts for the Amazon fly, and an effective poison bait for the control of the "hormiguilla" *Myrmelachista ramulorum* Wheeler in coffee, all by Wolcott; control of the sugarcane borer by means of the release of artificially reared, native egg parasites (*Trichogramma minutum* Riley) and establishment in Puerto Rico of *Larra americana* Sauss., a specific parasite of the changa, both by Wolcott and Martorell; and taxonomic position of the coffee leaf-miner, a coffee immune to the coffee leaf-miner, and the establishment of *Mirax insularis* Muesebl., all by Señ.

A factorial experiment comparing insecticides for control of cotton insects, J. C. GAINES. (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 512-515).—Report is made of a 36-plat factorial experiment conducted in the Brazos River Bottoms near College Station, Tex., to secure information on the value of insecticides used in a schedule of applications for the control of cotton insects. Comparisons between the several treatments, i. e., no treatment, sulfur alone, three stomach poisons, and the combination of sulfur and later applications of the stomach poisons, were made. Sulfur applied early in the season reduced the flea hopper infestation, but did not affect the yield. Applications of all stomach poisons significantly decreased the bollworm injury, bollweevil infestation, and rapid plant bug population and significantly increased the aphid population and yield. Natural cryolite-sulfur, 85-15, and lead arsenate-clay, 90-10, were more effective against bollworms than calcium arsenate, but less effective against the rapid plant bugs and were followed by fewer aphids. The arsenicals were more effective against weevils than the cryolite mixture. Using yields as the criterion, all stomach poisons were equally effective.

Effect of boll weevil control and cotton aphid control on yield as shown in a factorial experiment, R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 501-504).—Experimental applications of calcium arsenate and of both calcium arsenate and nicotine dust were followed by significant reductions in bollweevil infestation at Tallulah, La., and College Station and Waco, Tex., and significant increases in yield at Tallulah and College Station. Applications of nicotine dust and of both nicotine dust and calcium arsenate were followed by significant reductions in cotton aphid infestation at all localities except Florence, S. C., but they did not significantly affect bollweevil infestation or yield at any locality. Applications of both calcium arsenate and nicotine dust interacted to cause significant reductions in cotton aphid infestation at Tallulah, College Station, and Waco and to cause a significant increase in yield at Tallulah. Applications of calcium arsenate were followed by significant increases in aphid infestation at all localities. The increased yield following applications of both calcium arsenate and nicotine dust over that following calcium arsenate alone was 95 lb. of seed cotton per acre at Florence, 205 lb. at Tallulah, and 80 lb. at College Station, but at Waco there was a loss of 20 lb.

Insecticide tests for bollworm control during 1940, J. C. GAINES. (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 515-518, fig. 1).—Two experiments for bollworm control conducted at College Station, Tex., are reported. Comparison was made of the effectiveness of synthetic and natural cryolite, lead arsenate, commercial calcium arsenate, and a special calcium arsenate containing a high percentage of water-soluble arsenic pentoxide. Records of the infestations of weevils, rapid plant bugs, and aphids that developed on the plats made it possible to obtain some information on the action of the insecticides on these pests also. Lead arsenate and natural cryolite-

sulfur (85-15) gave better control of the bollworm than the calcium arsenates or synthetic cryolite-sulfur (85-15). All arsenicals were more effective against the weevils than the cryolites. The arsenicals containing the highest percentage of water-soluble arsenic pentoxide caused the largest increases in aphids, but gave the best control of the rapid plant bugs. In general the plats treated with arsenicals yielded more cotton than the plats treated with cryolites, because the cryolites did not give adequate control of the bollweevil.

Effect of different calcium arsenates upon boll weevils, cotton aphids, and plant bugs, and upon yields, R. C. GAINES, M. T. YOUNG, and G. L. GARRISON. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 495-497).—A study of the effect of calcium arsenates containing different percentages of water-soluble arsenic pentoxide (0.42, 11.4, and 16.5 percent) upon the bollweevil, the cotton aphid, the tarnished plant bug, and the rapid plant bug, and upon the yield of seed cotton, conducted in two fields, is reported upon, the results having been analyzed statistically. In these experiments the infestation records indicated that the three calcium arsenates were equally effective against the bollweevil. In both experiments applications of calcium arsenate containing 16.5 and 11.4 percent of water-soluble arsenic pentoxide were followed by greater increases in cotton aphids and greater reductions in the tarnished plant bug and the rapid plant bug as compared with the checks and the calcium arsenate containing only 0.42 percent of water-soluble arsenic pentoxide. The yields in each experiment also indicated that the three calcium arsenates were equally effective. In both experiments the calcium arsenate containing 0.42 percent of water-soluble arsenic pentoxide caused an average increase over the checks of 239 lb. of seed cotton per acre; the one containing 11.4 percent, 220 lb.; and the one containing 16.5 percent, 247 lb.

Insecticide tests on the bollworm, boll weevil, and cotton leaf worm in 1940, R. W. MORELAND, E. E. IVY, and K. P. EWING. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 508-511, fig. 1).—Report is made of cage toxicity tests at Waco, Tex., in 1940, in which various insecticides and mixtures of insecticides as dusts were compared with calcium arsenate against the bollworm, bollweevil, and the cotton leaf worm. "When bollworm larvae were arranged into four weight groups it was found that in general mortalities due to insecticides varied inversely with the weight of the larvae. A mixture of basic copper arsenate and lime killed a slightly higher percentage of large worms (over 45 mg.) than calcium arsenate killed of small worms (under 15 mg.). Against bollworm larvae of all weight groups, the average mortality after 120 hr. was 91.8 percent from the basic copper arsenate and lime mixture, 87.9 percent from lead arsenate, 83.7 percent from undiluted basic copper arsenate, 82.7 percent from cryolite containing 66.1 percent of sodium fluoaluminate, and 62.3 percent from calcium arsenate. Basic copper arsenate and mixtures of this material with lime and with sulfur gave somewhat higher kills of the bollweevil and of the leaf worm than did calcium arsenate."

Cryolite and cryolite-sulfur mixtures for boll weevil control and their effect on the cotton aphid, F. L. MCGARR. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 500-501, fig. 1).—The results of tests conducted at State College, Miss., during the season of 1940, in which synthetic cryolite alone and in commercial mixtures with sulfur was compared with calcium arsenate for the control of the bollweevil and for its effect on the cotton aphid, are reported upon. The cryolite-sulfur mixture containing 29.7 percent of sodium fluoaluminate gave no control of the bollweevil and that containing 34.6 percent of sodium fluoaluminate gave very little control. The cryolite alone was only about half as effective as calcium arsenate. The increase in aphids where

cryolite alone was used approached that where calcium arsenate was used, whereas with the cryolite-sulfur mixtures the aphid populations increased in proportion to the sodium fluoaluminatc.

Control of the cotton aphid and the boll weevil in 1940, R. L. MCGARR. (U. S. D. A., Miss. Expt. Sta., et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 580-582)—A study of the effect on the bollweevil and the cotton aphid of calcium arsenate, micronized calcium arsenate, and calcium arsenate-sulfur mixtures, with and without the addition of derris, nicotine sulfate, or tobacco dust as aphicides, conducted at State College, Miss., during the season of 1940, is reported. Calcium arsenate and mixtures of calcium arsenate and sulfur for bollweevil control caused significant increases in cotton aphid populations in that year. The addition of derris to these materials effectively controlled the aphids and held the populations at nearly the same level as the checks. There was practically no difference in aphid control from derris mixed with regular calcium arsenate, derris mixed with micronized calcium arsenate, and derris and calcium arsenate mixed and then micronized. Nicotine and tobacco dust when added to calcium arsenate were not effective in preventing an increase of aphids. Calcium arsenate and calcium arsenate-sulfur mixtures with derris gave good control of the bollweevil. There was no significant difference between these treatments and undiluted calcium arsenate under the conditions of this experiment (light weevil infestation).

Fruiting of cotton in relation to cotton fleahopper and other insects which do similar damage to squares, A. L. HAMNER (*Mississippi Sta. Bul.* 360 (1941), pp. 11, figs. 2; *Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 6, pp. 4, 5, figs. 2).—The complete loss of young squares through the third week in July failed to cause significant losses in the yield of seed cotton where the fruit was protected from bollweevil and other insects and disease was negligible. Plats which had the squares removed for more than 2 weeks produced cotton with a staple length about $\frac{1}{2}$ in. shorter than check plats. If there has not been a decided decrease in insect populations, control measures should be applied during the first week in July. Sulfur dust at the rate of 10 lb. per acre is effective against the cotton flea hopper, while a mixture of one part of calcium arsenate and two parts of dusting sulfur at the rate of 15 lb. per acre may be used in cases where it is also desirable to control bollweevil. Two applications should be sufficient for the control of flea hoppers.

Sawdusts in grasshopper bait, A. V. MITCHENER (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 538-540).—Experiments with poisoned baits in combating the clear-winged grasshopper, the two-striped grasshopper, and the lesser migratory grasshopper, all three of which are destructive to crops in Manitoba, are reported. The clear-winged grasshopper was killed most readily with poisoned baits. "Excellent results were obtained when the carrier was fine-out green barley plants or equal volumes of bran and sawdust, particularly when the sawdust was spruce or poplar. The effectiveness of the bait decreased when jack pine sawdust was used. Clear-winged grasshoppers were killed to a limited extent when pure sawdust was used as a carrier for the poison. This was particularly true for poplar sawdust. Fine-cut green wheat plants were very effective as a carrier for the poison in the single trial where they were used for the two-striped grasshopper. Equal volumes of bran and poplar sawdust were less effective. Bran and stock sawdust were not satisfactory, and very poor results were obtained with any sawdust alone. Jack pine sawdust was practically useless. The trials which were most extensive with the lesser migratory grasshopper indicated that the baits used were much less effective than for the clear-winged grasshopper. Both bran and green wheat plants were unsatisfac-

tory as carriers for the poison. Sawdust alone held very little attraction for this species of grasshopper."

It is considered evident that when compounding poisoned baits for grasshoppers each species should be treated as a unit, since it is possible that different species of injurious grasshoppers have tastes as distinct as those of the different species of domestic animals.

The bush locust *Phymateus leprosus* in the Eastern Cape Province, H. J. BISHOP (*Union So. Africa Dept. Agr. and Forestry Bul. 208 (1940), pp. 8, pls. 2*).

Toxicities of bordeaux mixture, pyrethrum, and derris to potato leafhoppers, T. C. WATKINS. (Cornell Univ.). (*Jour. Econ. Ent., 34 (1941), No. 4, pp. 562-565, figs. 4*).—A description is given of a slightly modified immersing method particularly suited to testing liquid contact insecticides against leafhoppers. The application of this procedure in tests with bordeaux mixture and with aqueous suspensions of pyrethrum and derris showed only the pyrethrum to have any appreciable toxicity in contact action on adult potato leafhoppers. A dosage-mortality curve for this material is presented.

Effect of dormant oil sprays on the eggs of *Stictiocephala inermis* (Fab.), an elm-infesting treehopper, A. KAGAN and F. A. FENTON (*Jour. Econ. Ent., 34 (1941), No. 4, pp. 541-542*).—In experiments at Stillwater, Okla., better control of *S. inermis* was obtained from the use of dormant oil sprays on Asiatic elm than on American elm. Applications to the American elm on March 22 were definitely superior to those made on December 4 and March 3, but on Asiatic elm, no significant difference in kill was observed. In the March 22 spray application on American elm, best control was obtained from 6-percent oil sprays. On Asiatic elm, an average of all dates of spraying shows that a 4-percent oil spray was about as effective as the more concentrated mixtures, and considering comparative costs, was the most efficient. Data on the effect of percentage of oil in the spray on control are conflicting in most instances, and more experiments should be carried out to clear up this point. In general, the data show that dormant sprays are not satisfactory for controlling *S. inermis* on elms.

Pea aphid control in Maryland during 1940, L. P. DITMAN, C. GRAHAM, and E. N. CORY. (Md. Expt. Sta.). (*Jour. Econ. Ent., 34 (1941), No. 4, pp. 560-562*).—Control experiments with the pea aphid at the Ridgely Substation in 1940 which were more extensive than those of 1938 and 1939 (E. S. R., 82, p. 75; 83, p. 656) are reported. They indicate that derris, either in dust or in spray, is superior to cube for the control of this pest, derris dusts being superior to derris sprays when applied under proper conditions. Moisture on the plants at time of application of derris dusts was found to be more important to the success of the treatment than high temperature at the time of application. Micronization (fine grinding) increases the effectiveness of either cube or derris. Nicotine spray appears highly effective against pea aphid when properly applied. The nicotine vaporizer gave the highest kill of all of the treatments used.

Instability of resistance to aphids in some strains of alfalfa, H. R. ALBRECHT and T. R. CHAMBERLAIN. (Ala. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent., 34 (1941), No. 4, pp. 551-554*).—In this study cuttings were obtained from two resistant Grimm plants, from which Blanchard and Dudley (E. S. R., 71, p. 73) reported resistant stocks, and crossed with the commercial varieties of alfalfa to determine whether the resistant character could be transmitted by hybridization. It is concluded that since plants which would not support the development of aphids in their first year, or seedling stage, became capable of supporting an abundant population of aphids a year later, the resistance as

it occurred in the plants studied is not a stable character. The possibility that the resistant character would be manifest under all conditions to which the plants would be normally subject in the field is recognized.

Derris and the control of the Mexican bean beetle, H. C. HUCKETT. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 566-571).—Experiments conducted under greenhouse conditions with larvae and adults of the Mexican bean beetle for the purpose of observing more closely the relation of derris sprays to their control are reported. Tests conducted under conditions of moisture and temperature considered favorable for the insect indicated that a large percentage of larvae and adults were capable of surviving 5 days' exposure to foliage sprayed with derris powder and that little if any feeding had taken place. Further tests indicated that the insect was capable of distinguishing sprayed and unsprayed foliage in the same cage for purposes of feeding, and that the proximity of derris on the foliage had little if any effect in retarding the insect from feeding on unsprayed foliage. Supplementary tests confirmed the fact that derris sprays are lethal when larvae and adults are directly hit in spraying. Otherwise their effectiveness when applied as for purposes of ingestion was dependent on their repellent properties and, in the case of larvae, on desiccation as a result of unfavorable living conditions on the soil surface. Tests with bordeaux mixture indicated that the spray residue on foliage served to reduce the amount of feeding by both larvae and adults and when containing derris powder exerted a marked effect in protecting the foliage.

The life history of *Phyllophaga tristis* (F.) and allied forms, H. J. REINHARD. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 526-532).—A study of the life history of a generation of *P. tristis apicata* revealed it to be similar to that of its allied forms (*P. tristis tristis* and *P. tristis amplicornis*). The beetles commence to emerge in numbers early in April, and oviposition continues over a period of 6 or 8 weeks. About 26 days are required for the eggs to hatch. Following a feeding period of a little more than 4 mo., larvae are commonly mature by September, and the major portion of the brood pupates during the same month. Pupal development is completed in about 3 weeks, so that newly transformed adults of a current generation are commonly present during October. The latter pass the winter in the pupal cells and emerge the following spring to complete a 1-yr. life cycle. As determined in the laboratory, the actual time required for completion of the life cycle is about as follows: Eggs 27 days, larva 128 days, and pupa 22 days.

Control of borers on recently top-worked pecan trees, W. C. PIERCE and C. B. NICKELS. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 522-526, figs. 3).—The results of biological observations and control experiments with the American plum borer and the pecan borer *Conopia scitula* (Harr.) conducted in central Texas during the years 1932-39 are reported. These pests often cause severe injury to recently top-worked pecan trees, pecan grafts and patch buds being destroyed by borer larvae feeding on the cambium and callus of the scion and stock. Most of the borer larvae enter graft wounds through cracks in the grafting wax. Patch-budded sprouts are also often girdled by borer larvae and may then be blown from the tree by wind. The inlay-bark graft method permitted the close fitting of scion and stock, which tended to reduce injury from borers. The best method of protecting scions from borer injury was to cover all graft wounds with a grade of grafting wax that would not crack until after the graft had formed a good union. Paradichlorobenzene dissolved in crude cottonseed oil at the rate of 1 lb. to 2 qt. of oil was effective in killing borer larvae in graft wounds.

Two buprestid cane-borers of brambles, with experiments on control, F. G. MUNDINGER. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 532-537, figs. 4).—Report is made of a study of the biology and control of the red-necked cane borer and *Agrilus rubicola* Abeille, referred to as the bronze cane borer, which attack the canes of many varieties of raspberries and blackberries in New York State. Their life history and habits are so similar that for practical purposes they may be considered as one. The hymenopterous parasite *Tetrastichus rugglesi* Roh. is responsible for a relatively high mortality among the borers, especially *A. rubicola*, during some seasons.

In control work, ground derris root was substituted for lead arsenate in the second application with very satisfactory results. Cryolite used as a first treatment followed by a later application of a derris spray was found to give very good control. In some instances one early lead arsenate spray was nearly as effective as when followed by a second application. Though the spring of 1940 was unusually wet and repeated rains destroyed much of the protective spray and dust covers, both the lead and the derris dusts gave promise of satisfactory control. Experimental data indicate that both lead arsenate and ground derris root when used at the rate of 4 lb. in 100 gal. still provided good protection against the beetles, also that two derris sprays were about as effective as where a derris spray was preceded by one of lead arsenate. A single derris spray at the rate of 5 lb. in 100 gal. applied immediately before bloom gave satisfactory control. The most promising schedule is one providing for 5 lb. of lead arsenate and 0.5 lb. of skim milk powder in 100 gal. of water applied just before bloom, to be followed about 2 weeks later by a spray consisting of 5 lb. of ground derris root and 0.5 lb. of skim milk powder per 100 gal. of water. The foliage should be well wetted by the spray, and any wild brambles growing nearby should also receive the same treatment. In the case of an excessively wet season, a third spray may be advisable. This suggested schedule has been followed in commercial plantings during the past two seasons with satisfactory results.

Control of the flea beetle *Phyllotreta vittata discedens* Weise in the Texas Gulf Coast, M. J. JANES. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 518-519).—Experiments for the control of *P. vittata discedens* reported indicate that a cube-sulfur dust containing 0.4 percent or more of rotenone will effectively control this flea beetle in the Texas Gulf Coast. Dusts containing pyrethrum apparently are less effective than those with cube.

Tests of species and varieties of vetch for resistance to the vetch bruchid, J. S. PINCKNEY and R. E. STITT. (Coop. N. C. Expt. Sta. et al.). (*U. S. Dept. Agr. Cir.* 617 (1941), pp. 6).—From 1936 to 1938 observations were made at Statesville, N. C., on plantings in both open field and caged conditions and with exposure to heavy populations of the vetch bruchid. Heavy infestations resulted in *Vicia villosa*, *V. dasycarpa*, *V. atropurpurea*, and *V. caroliniana*. Although a few eggs were deposited on *V. sativa*, *V. pannonica*, and *V. melanops*, no bruchid adults matured in the seed during the investigations. *Lathyrus hirsutus* and 12 other species of *Vicia* were tested in the same experiments, but no eggs were deposited on them.

Transmission of the Dutch elm disease pathogen by *Scolytus multistriatus* and the development of infection, K. G. PARKER, P. A. READIO, L. J. TYLER, and D. L. COLLINS. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 7, pp. 657-663).—In the investigations conducted, the Dutch elm disease fungus *Ceratostomella ulmi* was obtained from the outer surfaces of the smaller European elm bark beetle adults in higher percentage than from their intestinal tracts. Likewise, the numbers of colonies in the cultures were much greater. Transmission

of the fungus to potted healthy elm trees by the beetles in their feeding activities was readily obtained. The fungus was reisolated from feeding wounds on uninfected trees as long as 3 yr. following inoculation. Infection was obtained on trees inoculated during the late spring and early summer. Inoculations made later in the season induced infection less frequently or not at all. There was evidence that the fungus sometimes died in infected trees. Sometimes the infected twig died without the entire tree becoming invaded.

Dutch elm disease fungus prevalent in bark beetle infested elm wood, W. H. RANKIN, K. G. PARKER, and D. L. COLLINS (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 548-551).—The results of the work reported, which are considered to justify conclusions of a general nature, have shown that *Ceratostomella ulmi* is adapted to a saprophytic life dependent on the larval and adult activities of the bark beetles.

The internal application of chemicals to kill elm trees and prevent bark-beetle attack, R. R. WHITTEN (*U. S. Dept. Agr. Cir. 605* (1941), pp. 12).—Water solutions of sodium arsenite, copper sulfate, ammonium bifluoride, zinc chloride, copper nitrate, and copper chloride were the most effective of 34 chemicals applied internally to kill elm trees and prevent attack by the two principal elm bark beetles (smaller European elm bark beetle and native elm bark beetle). These solutions were applied by putting them in watertight bands fastened around the trunk where the bark had been cut through. Considerable difference was noted between the results of treatments made while the trees were in leaf and those made while the trees were dormant, the former being the most effective. The average cost of treating a 9.25-in. (diameter breast high) elm tree with zinc chloride solution was 69 ct. Quantitative chemical analyses of several thousand increment-core samples taken from elm trees treated with copper sulfate solution showed the following results: (1) Copper sulfate could not be recovered from samples taken over 20 to 25 ft. above the point of application in trees treated between December and April, (2) copper sulfate was recovered from all parts of trees treated between May and September, (3) approximately 80 percent of the copper sulfate present in treated trees is water-insoluble, (4) approximately 90 percent of the copper sulfate present in the xylem is confined to the outer fourth inch, and (5) trees allowed to stand for several months after treatment contain approximately as much copper sulfate in the inner bark as they do in the outer half inch of the xylem.

Tests of insecticides for boll weevil control during 1940, J. C. GAINES. (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 505-507).—In continuation of the work of the preceding year (E. S. R., 84, p. 78), a special calcium arsenate containing large particles and a high percentage of water-soluble arsenic pentoxide, a commercial calcium arsenate, and a cryolite-sulfur mixture were tested against the bollweevil at College Station, Tex., and Tallulah, La. Records were kept of the aphid populations at both locations and of the *Lygus pratensis oblineatus* (Say) and the rapid plant bug populations at Tallulah. The two calcium arsenates were equally effective in reducing the weevil population, and there was a nonsignificant difference in yield. The calcium arsenates gave a significant control of weevils and significant increases in yield over the cryolite-sulfur mixtures. All insecticides gave significant control and significant increases in yield over the checks. The special calcium arsenate contributed to higher increases in the aphid population, but apparently not enough to affect the yield. At Tallulah the mirid control was significantly better on the plats treated with the special calcium arsenate than on the plats treated with cryolite-sulfur mixture, but the population was low, causing little

injury. The special calcium arsenate gave better control of mirids than the commercial form, but the difference was not significant.

Spraying versus dusting for boll weevil control, K. P. EWING. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 498-500, fig. 1).—Report is made of tests at Waco, Tex., in 1939 and 1940, in which a power sprayer with three nozzles per row was used in applying calcium arsenate and lead arsenate under 300 lb. pressure to field cotton in comparison with the standard dust applications for bollweevil control. The plats ranged in size from 1.47 to 2.66 acres. There were three replicates each year, each replicate being in a separate field. In 1939, when there was a light weevil infestation, the plats sprayed with lead arsenate produced slightly more cotton than those dusted with calcium arsenate. In 1940, however, under conditions of heavy bollweevil infestation, calcium arsenate dust gave much better weevil control than calcium or lead arsenate spray and resulted in larger gains in seed cotton and greater profits.

Biology and ecology of the alfalfa snout beetle, C. LINCOLN and C. E. PALM ([*New York*] *Cornell Sta. Mem.* 236 (1941), pp. 45, figs. 12).—This wingless, parthenogenetic weevil feeds on the foliage of alfalfa and other plants. The larvae feed on roots of alfalfa, clover, and weeds. Eggs are usually deposited in the upper 2 in. of soil close to the host plant. The incubation period of eggs is shortest at temperatures of from 75° to 80° F. (9 to 10 days) and longest at 50° (74 days). After hatching, the larvae feed until the soil temperatures drop to between 40° and 45° (November and December) and then move down to overwinter. Field mortality among larvae is high in heavy populations. Normally the life cycle is of a 2-yr. duration, but a small percentage of the grubs do not pupate until the third summer, making a 3-yr. life cycle. Pupae and adults appear earlier in light well-drained soils than in heavy soils. At 50° the pupal period lasted 61.1 days and at 85°, 11.4 days. Adults move upward soon after the ground thaws in the spring and begin migrating the latter part of April. Eggs were oviposited on 21 different plants. Adults are able to survive the winter with less than an inch of soil protection when in sheltered locations with ample snow cover.

Timing cabbage worm treatments, G. E. R. HERVEY. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 572-575, figs. 3).—In an experiment with cabbageworms on Danish cabbage and on domestic cabbage grown in western New York for the manufacture of kraut, the author attempted to devise a satisfactory lead arsenate spray control schedule, particularly for the imported cabbageworm and the cabbage looper, which are of major importance. The findings indicate that in order to obtain maximum control at least three applications are necessary and possibly four in years of severe outbreak. A combination of three treatments directed against the third brood of these two pests during August would appear to be the logical procedure were it not that the plants are often too large for spraying to be practical at the time when the third treatment would be applied. Consequently, three applications, the first applied against the second brood of the imported cabbageworm between July 15 and 20, the second and third following at intervals of about 2 weeks, depending upon the development of the insects, appear to be the most practical combination. While an application against the second brood in July does not appear to have much value by itself, it does seem to contribute nearly as much as the other applications when used in a schedule. Where a schedule of two applications is being followed, the minimum number which could be expected to return the operator anything on his investment, the second and third would seem to be the most satisfactory combination.

Rate of application of derris-talc dusts for pickleworm control, F. S. ARANT. (Ala. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 520-521).—Report is made of control experiments with the pickleworm conducted in continuation of those in 1938 and 1939 (E. S. R., 84, p. 648). "Nine applications of a derris-talc-flour dust containing 1 percent rotenone were effective in controlling the pickleworm in late cantaloups on $\frac{1}{40}$ -acre plats. Applications at the average rate of 34.2 lb. per acre were not significantly more effective than those at the rate of 14.7 lb. per acre. There were strong indications that the higher rate of dusting reduced slightly the yield of melons, but clear-cut statistical proof of the reduction was lacking. A mixture of derris, talc, flour, and Cuproicide, 25-64-5-6, was no more effective in controlling the pickleworm than the derris and talc, but caused the plants to retain their foliage longer and also slightly retarded maturity. An average of 3,200 edible melons per acre was produced on five plats dusted with derris and talc as compared with an average of 96 edible melons per acre on the five check plats."

Factors influencing the formation of resting pink bollworm larvae, A. J. CHAPMAN and M. H. HUGHS. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 493-494).—Experiments with larvae overwintering in bolls as well as larvae overwintering in cocoons in the soil or on the surface of the soil were conducted at Presidio, Tex., to determine some of the factors conducive to the development of resting larvae. The findings emphasize the importance of early maturity of the cotton crop combined with early field clean-up, in areas where practicable, in reducing the number of pink bollworm entering the resting stage.

Control of the pink bollworm with insecticides, A. J. CHAPMAN and W. L. LOWRY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 490-492).—The results of tests with insecticides for the pink bollworm, conducted in the Presidio Valley of the Big Bend area of Texas from 1933 to 1940, are noted. Of the materials thus far tested against the larvae, the fluorine compounds, particularly cryolite, have given the best and most consistent results, considerable reductions in larval populations having been obtained when they were applied as sprays or dusts. Tests with ovicides in the laboratory indicate a need for further investigation.

Codling moth emergence-activity studies, E. GOULD and G. H. GEISSLER. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 576-579, figs. 7).—Recognition of the progressive increase in the codling moth population in the orchards of the Shenandoah-Cumberland fruit belt that has been taking place the past 10 yr. led to the project, commenced in the spring of 1937, here reported. A study of the activities of this pest in the years 1937, 1938, and 1939, summarized in graphs, emphasizes the fact that moth populations are determined almost entirely by weather conditions. Dense moth populations may produce only light infestations under adverse weather conditions such as frequently occur during first-brood activity. There is a close correlation between cage emergence and bait-pail activity, and this tends to verify the accuracy of the bait-pail method for determining moth emergence and activity. Calculated emergence, based on cage emergence and population of larvae of comparable age, compares even more closely with the bait records and this further substantiates the reliability of bait-pail records in accurately determining moth activity under field conditions. There was a delayed hatch entry of first-brood larvae clearly evident during both years for which entry records were available. The early heavy moth activity failed to produce corresponding early heavy infestation. Normally numerous first-brood entries are noted late in June and July long after all moth activity has ceased for the season.

Numbers of *Heliothis armigera* (Hbn.) and two other moths captured at light traps, C. H. MARTIN and J. S. HOUSER. (Ohio Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 555-559, fig. 1).—Experiments were conducted in 1938 and 1939, particularly with the tomato fruitworm, at Marietta, Ohio, to learn if light traps might be a possible method of control and to compare the attractiveness of various electric lights to the moths in tomato fields. The 1939 records for the armyworm and the tomato worm are also reported. Many of the tomato fruitworm moths were observed to loiter about the light traps and to rest on nearby objects before entering the traps. The brightness of the light did not seem to influence loitering. The moths of the tomato fruitworm and the armyworm did not show any sharp preference for any of a series of lights ranging in brightness from 2,300 to 65,000 lumens with the exception of a 150-w. tungsten Mazda light. More tomato worms came to the brilliant H-6 light than to weaker lights. The brighter lights of H-4 and S-4 lamps attracted from three to four times more tomato fruitworms than the lights of 100-w. and 150-w. tungsten Mazda lamps and of a 15-w. blue fluorescent Mazda lamp. No more tomato fruitworms came to a light with ultraviolet rays than to one of equal intensity and of about the same spectral quality but without ultraviolet. The brilliant H-6 light attracted more insects in general than the S-4 light or the light of a cluster of five 20-w. blue fluorescent lamps.

Onderzoekingen over de levenswijze der tabaksrupsen (Investigations on the biology of the tobacco caterpillars), P. A. VAN DER LAAN (*Meded. Deli Proefsta. Medan*, 3. ser., No. 8 (1940), pp. 47; *Eng. abs.*, pp. 43-44).—This report is accompanied by a list of 36 references to the literature. Of the species that damage tobacco at Deli, Sumatra, namely, *Heliothis assulta* Guen., *H. obsoleta* F. (= *H. armigera* Hbn.), *Plusia (Phytometra) signata* F., *Prodenia litura* L., *Psara ambitalis* Reb., and *Phthorimaca heliopa* Low., the life cycles of *H. assulta*, *Plusia signata*, and *Prodenia litura* have been studied and are reported upon.

The hessian fly in Oregon, L. P. ROCKWOOD. (Coop. U. S. D. A.). (*Oregon Sta. Cir.* 141 (1941), pp. 7, figs. 4).—A practical account which contains notes on the life history and habits, injury, and control of this pest in Oregon.

The hessian fly, L. HASEMAN (*Missouri Sta. Cir.* 212 (1941), pp. [4], fig. 1).—A practical account, with special reference to control.

Controlling bot and warble flies of livestock in Missouri, L. HASEMAN and W. E. ROLAND (*Missouri Sta. Bul.* 430 (1941), pp. 32, figs. 15).—An account of the bot and warble flies of Missouri, with notes on biological habits and methods of control.

A five-year survey on honeybee winter losses in Ohio, W. E. DUNHAM (*Ohio Sta. Bimo. Bul.* 211 (1941), pp. 141-146).—Results from a 5-yr. survey of overwintering bees in Ohio indicated that losses in unpacked colonies will be so severe that in 2 yr. out of 5 honey production will be unprofitable. Packing colonies for overwintering will result in smaller losses and prove especially effective during severe winters. Evidence demonstrated that colonies housed in packed two-story hives will suffer the least winter loss. When colonies of normal strength in quantity and quality of stores and pollen reserves at the beginning of the winter period are insulated with 4 in. of material on the sides and ends, 2 in. on the bottom, and 8 in. on the top of the hives, the hazards of winter are practically eliminated.

The black grain stem sawfly and the European wheat stem sawfly in the United States, E. J. UDINE (*U. S. Dept. Agr. Cir.* 607 (1941), pp. 9, figs. 7).—Two introduced sawflies, the black grain stem sawfly and the European wheat stem sawfly, are gradually spreading from the eastern wheat areas to the Middle West and South. The former has reached central Ohio and southern Virginia,

while the latter has spread southward from New York through the eastern half of Pennsylvania to Maryland and Delaware. The black grain stem sawfly caused serious damage to wheat in western Pennsylvania and eastern Ohio in 1934 and heavy infestations occurred in parts of Ohio for several succeeding years. Both species have a single generation annually and similar life histories except that adults of the European wheat stem sawfly appear about a week earlier. Larvae of these two species and that of the wheat-stem sawfly may be differentiated by means of an included key. Deep plowing of stubble, encouragement of strong wheat stands, and harvesting heavily infested wheat just before maturity are control practices suggested.

ANIMAL PRODUCTION

[Investigations on livestock production by the Indiana Station] (*Indiana Sta. Rpt. 1940*, pp. 14-15, 15, 34-35, 35-37, 87-93, 96, figs. 2).—Results of investigations conducted by C. L. Shrewsbury, L. P. Doyle, J. D. Hatfield, C. W. Carrick, S. M. Hauge, R. E. Roberts, C. W. Widaman, C. M. Vestal, C. Harper, F. G. King, J. R. Wiley, D. Whitson, I. D. Mayer, T. E. Heinton, and E. E. Schmetzler are briefly presented on the effect of fluorine on sheep; flavin requirements of chicks; softening of pork with hominy feed; Ca and P requirements of pigs receiving soybeans; protein supplemental mixtures for pigs and sows; a comparison of open-pollinated and hybrid corn for growing and fattening hogs; cut and whole hay for lambs; leguminous hays for wintering ewes; dipping ewes for increased wool production; silage for fattening steers; the types and grades of market hogs and the grade and quality of carcasses and pork produced; the utilization of varying types and levels of fat by chickens; the substitution of soybean meal and corn for bran and middlings for chickens; protein levels for 6-week-old chicks; lower levels of meat scraps and soybean meal for chicks after starting; dried milk and condensed whey in the broiler ration; heat, ventilation, and humidity for layers; the effect of electric lights and ultraviolet irradiation upon the growth of young chicks; the effect of high- and low-wattage electric lights upon laying pullets; inheritance of rate of growth in chickens; starting and growing rations for turkeys; breeding of a small market-type carcass in turkeys; artificial light for stimulating hatching of turkey eggs; and death loss in newborn pigs from sows on different rations.

[Feeding of beef cattle, sheep, hogs, and poultry by the Nebraska Station] (*Nebraska Sta. Rpt. [1940]*, pp. 36-44, 48-52, 66-68, 71, fig. 1).—Results are presented on studies on the use of oil meals in comparison with plant and animal proteins for pigs in dry lot and on Sudan grass pasture; growing pigs on limited grain rations; hard hybrid corn not quite equal to open-pollinated corn for fattening cattle and growing chickens; soybean meals v. cottonseed cake as protein supplements and grain sorghums v. corn for fattening cattle; wintering calves and other stock at the North Platte and Valentine Substations; lamb-feeding tests with corn, sorghums, cottonseed meal, soybean meals, alfalfa hay, and silage; the utilization of cereal grains and time of consumption by growing chicks; antirachitic value of lamp radiation for laying hens and growing chicks; Sudan grass meal in rations for laying hens; growth-promoting value of Sudan grass influenced by curing methods; comparison of sunflower seed and yellow corn in rations for turkeys; plant and animal sources of protein for poults; and growth-promotion value of alfalfa meal and a fish-extract powder.

[Investigations in livestock production by the North Carolina Station]. (Partly coop. U. S. D. A.). (*North Carolina Sta. [Bien.] Rpt. 1939-40*, pp. 43-44, 45-48).—Brief reports are given of studies of cottonseed meal as a

profitable supplement to grass hay for wintering beef cattle, native reeds as a valuable grazing crop for beef cattle, fattening cattle on roughage alone, favorable results produced by mature soybeans in pigs during the early fattening period, small grain-lespedeza as a supplementary pasture for sheep, soybean hay in the ration of sheep, benefits of shearing lambs, and early breeding of ewes.

The utilization of feed as affected by grinding, V. G. HELLER, R. WALL, and H. M. BRIGGS (*Oklahoma Sta. Tech. Bul. 10 (1941), pp. 10*).—Rabbits, rats, and sheep fed on coarsely and finely ground, balanced rations showed, in general, no difference in metabolism, growth, reproduction, or blood Ca and P, but the rations ground to a powdery state were less palatable. Considering the cost, fine grinding of feeds is, therefore, not recommended.

The value of urea in the synthesis of protein in the paunch of the ruminant, I, II, L. E. HARRIS and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr., 22 (1941), No. 2, pp. 167-196, figs. 2*).—Two studies on the use of urea for maintenance and growth are reported.

I. *In maintenance* (pp. 167-182).—The endogenous N excretion of sheep averaged 0.0333 gm. per kilogram of live weight, or 1.231 gm. per square meter of body surface, and the metabolic N in the feces averaged 0.55 gm. per 100 gm. of dry matter consumed. These results were obtained in a series of N balance experiments with eight sheep 15 to 18 mo. of age and from 27 to 40 kg. in weight. When the low-N rations were supplemented with urea or casein, appetites improved and weight was more easily maintained for over 100 days. When added to low-N rations, urea had a digestibility of 88.8 percent, and the digestibility of cellulose was improved. Casein N as a supplement had a digestibility of 86.9 percent. N equilibrium was maintained on an average of 202 mg. of urea N or 161 mg. of casein N as a supplement to the basal ration. The biological value of urea N averaged 62, and casein N averaged 79. At the lowest level of intake, casein N was somewhat better utilized than urea in metabolism. Other findings indicated that urea N was not excreted through the skin.

II. *In growth* (pp. 183-196).—Urea N was added to a low-N ration for 23 grade wether lambs ranging from 50 to 80 lb. in weight. In studies of the N balances, with successive additions of urea to rations containing 8, 11, and 15 percent of protein, the average biological values were 74, 60, and 44, respectively. Normal and near-normal growth were promoted without evidence of toxicity over a feeding period of 110 days.

The goitrogenicity of soybeans, H. S. WILGUS, JR., F. X. GASSNER, A. R. PATTON, and R. G. GUSTAVSON. (Colo. Expt. Sta.). (*Jour. Nutr., 22 (1941), No. 1, pp. 43-52*).—Further study of goiter production in chicks (E. S. R., 81, p. 263) showed that the goitrogenicity of soybean products was partially inactivated by heat, and that iodine counteracted the effect on the thyroid although it did not improve growth. In a series of experiments, the residues from the successive extractions of soybeans with acetone, ethanol, and ethyl ether were not significantly less in goitrogenic activity than the original. A ration containing 12 percent of soybean meal produced as severe goiter as a ration containing 30 percent. Alfalfa seemed to have some antigoitrogenic activity, but production of mild goiter occurred on a ration containing casein. The thyroids were removed, weighed, and studied histologically at the conclusion of the experiment.

Seasonal calcium and phosphorus requirements of range cattle, as shown by blood analyses, J. H. KNOX, J. W. BENNER, and W. E. WATKINS (*New Mexico Sta. Bul. 282 (1941), pp. 28, figs. 7*).—The amounts of Ca and P in the forage eaten by range cattle in the spring and summer months were higher

than in the winter. The study was conducted on two 4-section tracts with 10 cows and calves, 2 dry cows, and 2 steers each, one group receiving supplements of 40 percent of dicalcium phosphate and 60 percent of salt and the other salt alone. Determinations indicate that Ca in the blood was not a satisfactory measure of the Ca intake, but inorganic P was closely related to the intake of P in the feed. During the course of the 4-yr. experiment, forage and blood analyses showed that, except for a short period at the height of the growing season, the P consumed from the forage was insufficient to nourish the breeding cows. On the other hand, it appeared that the P in the forage was sufficient for mature dry cows. Mature breeding cows which received the P supplements produced more and heavier calves than those which received no supplement to their forage ration.

Delta-grown oats and barley versus corn for finishing beef calves, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 6, pp. 7-8*).—Advantage in the rate and economy of gain and dressing percentage was shown for corn over oats and barley fed with cottonseed cake, sorghum silage, and lespedeza hay when fed to fattening calves in a 170-day test. However, it was calculated that the entire experiment was conducted at a loss.

How much cottonseed cake may be fed to fattening calves? Two-thirds of ration with C. S. M., corn, on even price basis, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 7, p. 8*).—Results of feeding four lots of heifer beef calves on rations containing approximately 2, 4, 6, and 8 lb. of cottonseed cake per day showed that the best gains and selling price were obtained by the lot receiving the least cake, but the differences were small. It was concluded that the calf-fattening ration may contain as much cottonseed cake as two-thirds of the concentrates without significantly lowering the efficiency.

Dried sweetpotatoes for finishing calves, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 8, pp. 1, 8*).—Four steers on rations of dried sweetpotatoes ad libitum with cottonseed meal, Dallis grass hay, sorghum silage, and oystershells made average daily gains of 1.84 lb. as compared with 1.8 lb. for 10 heifer calves receiving a comparable corn ration. Although some lameness and scouring were observed, the results are considered promising.

Factors determining quality in beef, F. N. BONSMAN and R. HIRZEL (*Union So. Africa Dept. Agr. Pam. 226 (1941), pp. 34, figs. 25*).—A discussion of factors making for quality in cuts of beef handled and fed differently.

Cull beans and cottonseed meal as a supplement for wintering breeding ewes, L. H. BLAKESLEE, G. A. BROWN, and J. G. WELLS, JR. (*Michigan Sta. Quart. Bul., 24 (1941), No. 1, pp. 49-52*).—On the average, over a 3-yr. period, cull beans and cottonseed meal in rations of hay and grain mixtures gave equally favorable results for wool and lamb production by breeding ewes.

Swine feeding (Puerto Rico Univ. Sta. Rpt. 1940, p. 60).—A dry-lot feeding experiment, by M. A. Martorell, Jr., comparing home-grown and a commercial feed is reported.

Feeding corn and cottonseed meal to fattening pigs on fall-sown oat pasture in the Mississippi Delta, W. P. McFADDEN (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 8, p. 2*).—A ration of 85 parts of corn and 15 parts of cottonseed meal with oat pasture produced average daily gains of 1.61 lb. on pigs weighing 70-75 lb. The rates of gain during the 85-day feeding period were slightly reduced with modifications in the concentrate mixture, but the economy of gain was superior with a ration of 70 parts of corn meal and 30 parts of cottonseed meal.

Oats, barley, corn tested in ration for fattening pigs; corn and barley best, oats a satisfactory concentrate, P. G. BEDENBAUGH (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 6, p. 2).—With ground corn and ground barley, self-fed with tankage on pasture, average daily gains were produced of 1.91 and 1.69 lb., respectively. Two lots similarly fed ground oats made gains of 1.46 and 1.52 lb. daily. The barley- and corn-fed groups required less grain than those fed on oats. It was noted that with barley there was a greater amount of grazing.

Spelt equals oats for feeding pigs, V. A. FREEMAN (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 41-42).—Spelt and oats fed with corn gave similar results in three experiments with feeding 54-lb. pigs.

Digestion and absorption by foxes and minks, R. BERNARD and S. E. SMITH. (Cornell Univ.). (*Amer. Fur Breeder*, 14 (1941), No. 2, p. 22).—The greater digestibility of nutrients by foxes than by minks of certain feeds, particularly those of a fibrous nature, is accounted for by the more rapid transit of the nutrients through the intestinal tract of minks.

Horse meat for fur farms: Its chemical composition, S. E. SMITH and C. F. BASSETT. (U. S. D. A. coop. Cornell Univ. et al.). (*Amer. Fur Breeder*, 14 (1941), No. 2, pp. 14-16).—Analyses of 16 samples of horse meat showed fat to be the most variable constituent, ranging from 0.4 to 12.7 percent, depending on the condition of the animal. In general, the fat content was lower than that of beef and was inversely related to the water content.

[Poultry breeding and feeding by the North Carolina Station] (*North Carolina Sta. [Bien.] Rpt. 1939-40*, pp. 48-51, fig. 1).—Studies are reported on the superiority of certain families of turkeys, high-grade peanut meal as a 50-percent substitute for animal protein in laying mash, crossbred chicks as broilers and layers, breeding of White Leghorns for resistance to coccidiosis, and the decrease in mortality of poultry through breeding.

Fleshing mash vs. heavy feeding of grain for winter egg production, G. P. GOODEARL (*North Dakota Sta. Bul.* 301 (1941), pp. 7).—Feeding on fleshing mash and grain rations produced no differences in Rhode Island Reds and White Leghorns in the number and weight of eggs produced, weight of birds, feed requirement per dozen eggs, or mortality.

The biologic response of chickens to certain organic acids and salts with particular reference to their effect on ossification, J. T. CORRELL (*Jour. Nutr.*, 21 (1941), No. 5, pp. 515-525).—In a series of investigations, no protection from rickets was found for chicks in an organic acid or its sodium or potassium salt when on a rachitogenic diet, although such protection has been described for rats by Hathaway and Meyer (*E. S. R.*, 82, p. 703). The supplements included sodium and potassium citrate, but only cod-liver oil increased the growth or the weight of the bone ash of chicks at 21 days of age. Most cationogens fed to chicks caused the precipitation of the salt in the animal's body and therefore were toxic. Potassium citrate was less toxic than sodium citrate. Likewise, vitamin D allowed greater tolerance for the toxicity of these citrate compounds. Additions of ammonium carbonate-ammonium chloride mixtures to a nonrachitogenic diet for chicks did not produce rickets as in the rat.

The use of egg containers treated with a mycostat in commercial cold storage, W. L. MALLMANN and R. E. CARE. (Mich. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 6, pp. 344-347).—The incidence of molds was much lower in eggs stored in strawboard fillers and flats treated with 0.31-0.35 percent of sodium pentachlorophenate than with untreated fillers and flats.

Penicillia were absent from eggs stored under treated conditions in three storage plants. No undesirable flavor was imparted by the treatment.

Boning poultry, J. A. DAVIDSON, P. J. SCHAIBLE, and R. PILLAR (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 11-19, figs. 12).—An illustrated description of methods previously noted (*E. S. R.*, 85, p. 237).

Significance of shrinkage in meat preservation, M. D. SUMULONG (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 1, pp. 5-23).—Shrinkage in weight of cattle and hog carcasses during 24-hr. chilling averaged 2.17 and 2.09 percent, respectively, whereas carabao carcasses averaged 2.41 percent. Little shrinkage occurred after from 12 to 18 hr. Shrinkage of ham and bacon in trimming, drying, and curing was especially heavy. The average loss of dry-cured ham after 2 months' aging was 28.59 percent. Sweet pickle-cured hams and picnics lost 13.81 and 13.65 percent, respectively, after smoking. In cooked boneless hams there was an average loss of 20.04 percent. The data serve to indicate the losses likely to be encountered in different meat packing operations and were obtained from animals slaughtered in the Philippine Bureau of Animal Industry in several experiments.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1940*, pp. 15, 45-46, 48-52).—Included are brief progress reports (*E. S. R.*, 84, p. 234) on a comparison of a rotation pasture of alfalfa-brome mixture with bluegrass pasture for milking cows, by G. O. Mott, J. H. Hilton, and J. W. Wilbur; input as related to output in milk production (coop. U. S. D. A.), and the fat test of milk as affected by feeds, both by Hilton, Wilbur, and W. F. Epple; the determination of vitamin A requirements of dairy cattle, by Hilton, Wilbur, and S. M. Hauge; and consumer reactions to butter of definite grades and characteristics, by K. C. Boxell.

Reports of other dairy products investigations, by B. E. Horrall, J. C. Crane, P. R. Elliker, W. H. Brown, Epple, and Hilton, include the lecithin content of milk and its products; determination of choline in extracted milk fat; the character of Indiana butter from the standpoint of quality; a physical, chemical, and bacteriological study of factors affecting body, texture, and quality of ice cream; the effect of H-ion concentration, types of micro-organisms, and season of the year upon the keeping qualities of butter as manufactured under commercial conditions; the enzymes in sweet and sour farm-skimmed cream as related to the keeping qualities of butter; and the cause and remedies of some abnormal flavors in milk with special reference to "cappy flavor."

[Experiments in dairying by the Nebraska Station] (*Nebraska Sta. Rpt. 1940*, pp. 44-47, 48, 71).—In addition to brief abstracts of publications previously noted, results are briefly presented on the nutritive value of grain and forage sorghums; the effect of subcutaneous administration of wheat-germ oil on the breeding efficiency of dairy heifers; hormonal inhibition of lactation; the rate and economy of milk production by Milking Shorthorn cows; the effect of bindweed, peppergrass, and penny-cress in the dairy ration on milk flavor; methods for the determination of fat in ice cream; and a description of a new variety of cheese called "Husker."

[Dairy cattle investigations in North Carolina] (*North Carolina Sta. [Bien.] Rpt. 1939-40*, pp. 44-45).—Results are briefly presented on the value of various feeds rich in vitamin A as supplements to cottonseed meal in cattle feeding, the vitamin content of soybeans and cowpeas, and the value of supplementary pastures and silage as major sources of nutrients for dairy cows.

The influence of winter management on chemical composition of herbage from dairy pastures, I. R. J. McILROY and M. P. BARTRUM (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 3A, pp. 166A-175A).—Herbage samples were collected at approximately 3-week intervals during the winter season for a closely grazed pasture and from one on which fall growth had been allowed to accumulate for late winter grazing. Data are presented on the chemical composition of these samples and also hay and silage prepared from similar pasture herbage. The protein content of the mature pasture was higher than that of the closely grazed pasture during the winter months, but the position was sharply reversed when spring growth started. No seasonal variation in mineral content was observed. Trends in other constituents are discussed.

Present knowledge of the nutritional value of grassland herbage. W. M. NEAL. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 666-670).—The principal topics covered in this discussion are the nutrients supplied by herbage, methods of evaluation, and factors affecting the nutritive value.

Milking cows on pasture: Meat meal as a supplementary source of protein. A. C. T. HEWITT (*Jour. Dept. Agr. Victoria*, 39 (1941), No. 7, pp. 329-334, figs. 4).—The first section of this report presents the results of a 2-yr. grazing experiment with milking cows at the State Research Farm, Werribee. Seasonal variations in the returns from pasture and the required level of supplementary feeding necessary to maintain steady production throughout the year are strikingly presented. The second section describes an experiment in which the regular winter ration of ground cereal grains, wheat bran, and ground peas was supplemented with 1.5 lb. of meat meal per cow daily. Both the total milk production and the butterfat content of the milk were significantly increased by this practice as compared with the control group receiving only the basic ration. The meat meal had no undesirable effect on milk flavor.

Feeding concentrates and the cost of producing cows' milk under Alabang Stock Farm conditions in 1937, 1938, and 1939. L. J. PALICTE (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 2, pp. 141-151).—An analysis of the feed and labor costs for milk production under Alabang Stock Farm conditions indicated that the 3-year-average total cost of producing 1 l. of fresh raw milk was about 8.5 ct.

Legume silage in dairy feeding. S. I. BECHDEL, R. W. STONE, P. S. WILLIAMS, and F. R. MURDOCK (*Pennsylvania Sta. Bul.* 411 (1941), pp. [2]+22; figs. 3).—The results of numerous experiments with legume silages are summarized. When liberal amounts of alfalfa-molasses silage were fed in combination with corn silage and alfalfa hay, it was possible to reduce the rate of concentrate feeding from a ratio of about 1 lb. to about 3 lb. of milk daily to 1 lb. of feed for 4.5 lb. of milk without materially affecting the rate of milk production. However, complete elimination of concentrate feeding resulted in a very rapid decline in milk production. When fed in combination with corn silage and mixed hay, alfalfa silages preserved with 80 lb. of molasses or 16 lb. of phosphoric acid per ton were of about equal feeding value. However, cows receiving the phosphoric acid silage frequently went off feed and developed digestive disturbances, while no such troubles were encountered with the alfalfa-molasses silage. Alfalfa-molasses silage proved somewhat superior to corn silage when fed with timothy hay and a low-protein concentrate mixture to growing dairy heifers. Alfalfa-molasses silage (80 lb. of molasses per ton) and soybean-molasses silage (120 lb. of molasses per ton) were of equal value for milk production when fed with corn silage and hay. The soybean silage was somewhat more palatable. Silage production costs favored the alfalfa. During

each of four seasons alfalfa-molasses silage was fed very advantageously to milking cows and heifers as a supplement to short pastures in late summer. Fermentation tests indicated that alfalfa preserved with molasses generally produced more lactic acid than when preserved with phosphoric acid. Silage quality measured in terms of lactic acid produced improved as the amounts of molasses for preservative increased from 40 to 120 lb. per ton. The retention of carotene in legume silages was very high during the early months of storage. Later, carotene tended to decrease appreciably, the rate of decline being much more pronounced in alfalfa-phosphoric acid silage than alfalfa-molasses silage.

In vivo studies of hydrogen ion concentrations in the rumen of the dairy cow, V. R. SMITH. (Oreg. Expt. Sta.), (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 659-665, figs. 3).—Averaging the readings obtained at six different locations in the rumen of two cows three times daily over a 5-day period, the mean pH of the rumen contents was 6.27 when alfalfa hay alone was fed and 6.0 when alfalfa hay and beet pulp were fed. The readings obtained at 2-hr. intervals over a 24-hr. period averaged 6.30 and 6.07 on the alfalfa and the alfalfa-beet pulp rations, respectively. Values fluctuated throughout the day, the ingesta generally being more alkaline shortly before and after feeding. Lower values were obtained by in vivo determinations than on material removed from the rumen, although the latter were made within 30 min. after the ingesta were removed.

Further studies of the influence of different levels of fat intake upon milk secretion, III, L. A. MAYNARD, J. K. LOOSLI, and C. M. McCAY ([*New York*] *Cornell Sta. Bul.* 753 (1941), pp. 18, figs. 2).—Continuing this series (E. S. R., 71, p. 832), two additional experiments are reported, one a continuous feeding trial of 98 days' duration and the other a double reversal trial extending over 105 days, comparing the effect on milk production of concentrate mixtures containing 3 and 7 percent fat. The low-fat ration was attained by including feeds from which fat was removed in varying degrees by pressure (hydraulic or expeller process). Timothy hay, corn silage, and dried beet pulp were common to both rations. The high-fat group of cows produced 4.4 percent more milk, 2 percent more fat, and 4.1 percent fat-corrected milk in the first experiment and 1.1 percent more milk, 3.4 percent more fat, and 2.4 percent more fat-corrected milk in the second experiment. These findings essentially confirm results of earlier trials (E. S. R., 82, p. 95) in which the fat content of the rations was reduced by solvent extraction. A summary of previous experiments on this problem is included.

The effect of feeding some fat soluble dyes to milking cows upon the color of milk fat, C. F. HUFFMAN and C. W. DUNCAN (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 54-55).—When trials were conducted with Sudan III, Sudan IV, brilliant green, and perfect purple, each fed at the rate of 15 gm. dissolved in 0.5 lb. of soybean oil, the Sudan III or Sudan IV imparted a pronounced pink color to the butterfat, most intense 24 hr. after feeding. Some color persisted up to 144 hr. after feeding Sudan IV. The brilliant green gave only a greenish tinge to the butter, but purified butter oil was definitely green. Greatest intensity occurred at 36 hr. after feeding, and some color persisted for 132 hr. The perfect purple gave a pronounced green color to the fat, which was most pronounced at 36 hr. and persisted at a diminishing rate for more than 84 hr. Nigrosine black, fed at a 45-gm. level, imparted a pink color to the butterfat. The possibility of using these fat-soluble dyes in studying the relation of food fat to milk fat is indicated.

Reproductive performance in dairy cattle, I. R. JONES, R. W. DOUGHERTY, and J. R. HAG (*Oregon Sta. Bul.* 395 (1941), pp. 27, figs. 12).—A brief review of the physiology of reproduction in cattle and a discussion of the economic significance of poor reproductive performance are included in this bulletin, along with conclusions based on extensive studies of the problem. An analysis of the breeding records of the State College herd and other dairy herds indicated the significance of inheritance in good fertility. Much of the infertility in herds is attributed to the inheritance of low fertility and close-breeding practices. Studies on the role of nutrition in reproductive performance indicated that a ration adequate for normal growth in young females and for the maintenance of weight, health, and vigor in mature animals was satisfactory for good reproduction. Avitaminosis A sufficiently severe to affect reproduction was encountered only when roughage almost devoid of green color was fed throughout the gestation period. Experiments on the feeding or injection of vitamin E carriers failed to demonstrate the need of vitamin E supplements for dairy cattle. Impairment of breeding efficiency as a result of many nonspecific types of infection is discussed, and it is pointed out that the absence of Bang's disease infection does not insure good reproductive performance. Appraisal of semen quality by microscopic examination proved to be of doubtful value except in the case of extremely low quality. Slaughterhouse data showed from 20 to 25 percent of females sold as sterile to be pregnant. A higher percentage of heifers than cows were difficult to get with calf. The purposeful delayed breeding of females either as heifers or between lactations was not found to be correlated with poor breeding.

What should be the length of the calving interval? J. G. WELLS, JR., and R. E. HORWOOD (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 52-53).—A study of the production records of 27 purebred Holstein cows indicated that a much higher percentage of cows having a between-calving interval of less than 365 days produced above 1 lb. of butterfat per day for the entire lactation period than those with calving intervals exceeding 365 days. It is recommended that cows be bred at the first oestrous period following approximately 6 weeks after calving.

Carabao raised for milk, T. V. RIGOR (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 2, pp. 135-139).—A general discussion of the selection, feeding, and management of carabao.

The milk supply in time of war, N. C. WRIGHT (*Jour. Roy. Agr. Soc. England*, 101 (1941), pt. 2, pp. 44-56, figs. 7).—An extensive discussion of factors tending to reduce milk production, the effect of the feeding stuffs rationing scheme, and methods for increasing the supplies of home-grown feeding stuffs.

A serious flavor defect in milk, C. D. DAHLE. (Pa. State Col.). (*Pa. Assoc. Dairy Sanit. Ann. Rpt.*, 17 (1941), pp. 89-99).—A discussion of the causes and methods of preventing oxidized flavor development in milk.

Bitter milk problem costly to dairymen, dairy plants, met by pasture improvement, F. H. HERZLER (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 6, pp. 1-2).—Feeding experiments gave evidence that the consumption of 4 lb. of bitterweed per cow daily resulted in slightly bitter milk, and 7 lb. in an extremely bitter flavor. Production of bitter milk persisted for about 24 hr. after feeding of the weed was discontinued. Butter produced from bitter milk was practically free of off-flavor, but cheese or ice cream manufactured from such milk was unsalable. When evaporated milk was made from bitter milk, the off-flavor was intensified in proportion to the ratio of concentration.

The microscopic detection of bacterial defects of milk, C. S. BRYAN (Mich. State Col.). (*Vet. Med.*, 36 (1941), No. 8, pp. 415-419, figs. 16).—Information to be gained through the microscopic examination of milk is discussed.

Methods for the bacteriological examination of milk bottle caps, hoods, and closures, J. R. SANBORN and R. S. BREED. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 4 (1941), No. 2, pp. 63-67, fig. 1).—A proposed method consists of introducing about 10 cc. of melted, cooled standard agar into the concave cup of a sterile unblown milk bottle blank. The cap or closure to be tested is then applied over the opening, the blank inverted, and the agar allowed to harden, followed by incubation at 32° or 37° C. for 48 hr. The cap or closure is then removed and the colony count determined. Methods whereby hoods, closures, or metal foil strips form receptacles for agar media for direct contact counts are also described. The results obtained by rinsing methods and contact culture methods were generally comparable. Tentative bacteriological count standards for fabricated closures are discussed.

Testing the sterility of bottles, H. BARKWORTH (*Dairy Indus.*, 6 (1941), No. 2, pp. 35-37).—In this report on methods of testing the sterility of bottles the advantage of using 20 cc. of sterile water for rinsing as compared with the common practice of using 90 cc. is stressed. Experimental evidence was secured to indicate that commercially washed bottles can maintain the proposed standard of 200 bacteria per bottle, and that when this standard is enforced a coliform test gives no additional information and is superfluous.

A comparative study of high-temperature, short-time, and holder pasteurization, A. MILLENKY and H. J. BRUECKNER ([*New York*] *Cornell Sta. Bul.* 754 (1941), pp. 26, figs. 7).—A temperature of 143.5°-144° F. for 30 min. in the holder method of pasteurization and a range of temperatures from 161° to 180° for 22.5 sec. in the high-temperature, short-time method were employed in a series of comparisons reported. All trials were conducted with commercial equipment. The cream volume of milk measured 24 hr. after pasteurization showed that milk heated to 161°-163° was equal or superior to holder-pasteurized milk in creaming ability. Higher temperatures increasingly reduced the creaming ability of the milk. The high-temperature milks showed maximum cream volume in 24 hr., whereas the holder-pasteurized milk showed maximum creaming in 4 hr. When the normal bacterial flora was present in the whole milk, short-time pasteurization at 161° or higher was fully as effective as the holder method in destroying the bacteria. When the heat-resistant strains were present, a temperature of 165° was required to equal the holder method. Phosphatase readings on the milk pasteurized at high temperature were consistently low, and in every instance were slightly below those obtained on the same milk subjected to the holder method. All temperatures above 161° effectively preserved the ascorbic acid present in the raw milk for 48 hr., and these milks were significantly richer in ascorbic acid than raw or holder-pasteurized milk after 5 days' storage. In milk heated to 180°, the vitamin C was retained for longer periods up to 20 days. The development of oxidized flavor was inhibited for 48 hr. or longer by the high-temperature pasteurization, whereas that from the same batch pasteurized by the holder method had an oxidized flavor in 24 hr.

Analyses of various portions of frozen homogenized milk, G. M. TROUT (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 31-40).—Data are presented on the composition of upper, middle, and lower layers of milk which had been processed in various ways and then subjected to freezing and thawing. A summary of these findings has been noted previously (E. S. R., 85, p. 526).

The significance of lipolysis in the curd tension and rennet coagulation of milk.—I, The role of fat globule adsorption "membrane." II, The effect of the addition of certain fat acids to milk, N. P. TARASSUK and G. A. RICHARDSON. (Univ. Calif.). (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 667-677).—Section 1 of this report describes experiments with synthetic creams prepared as previously reported (E. S. R., 81, p. 833). In all cases where raw skim milk was used as a source of plasma in the remade milk with the fat globules having an artificial adsorption membrane, extensive hydrolysis of the fat occurred. Buttermilk obtained from churning such synthetic creams failed to clot with rennet. These buttermilks were characterized by abnormally low pH and surface tension values, indicative of the presence of free fat acids as a result of extensive lipolysis. Relatively little hydrolysis of the fat occurred in parallel tests in which pasteurized skim milk was used as a source of plasma. The second section reports experiments in which fat acids were added to milk in amounts sufficient to produce a pH comparable to that occurring in the remade milks described above. When lauric, myristic, or palmitic acids were added and the milk aged at cold temperature, rennet coagulation was inhibited, whereas additions of caproic or oleic acid failed to exhibit this effect. Normal rennet coagulation and curd tension of the milks were restored if the physical state of the fat acids involved was changed from the solid to (or near to) the liquid state.

The effect of curd tension of milk on the utilization of added vitamin D, W. E. KRAUSS, T. S. SUTTON, L. H. BURGWARD, R. G. WASHBURN, and R. M. BETHKE. (Ohio Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 691-694).—Bio-assays of normal milk, homogenized milk, and mineral-modified soft-curd milk, all from the same source, and natural soft-curd milk, all fortified to the extent of 400 U. S. P. units of vitamin D per quart, indicated that they were practically identical both in prophylactic and curative values. Apparently the curd tension of the milk did not influence the effectiveness of added vitamin D.

Phosphatase production in dairy products by microorganisms, B. W. HAMMER and H. C. OLSON. (Iowa Expt. Sta.). (*Jour. Milk Technol.*, 4 (1941), No. 2, pp. 83-86).—A wide variety of micro-organisms was tested for ability to produce phosphatase when incubated in sterile milk. Marked phosphatase production occurred with several species of the genus *Pseudomonas*, particularly *P. putrefaciens* and *P. nigrifaciens*. Certain cultures of *Aerobacter* gave a positive reaction, but all *Escherichia* cultures were negative. Cultures of *Oospora lactis*, while varying in degree, gave positive results. Some cultures of *Alcaligenes* were positive, others negative. Negative results generally resulted from organisms of the genera of *Streptococcus*, *Propionibacterium*, *Bacillus*, and *Clostridium*. When selected cultures were similarly tested in unsalted butter, phosphatase production generally resulted from those organisms which produced the enzyme in milk. With salted butter, production of phosphatase was less rapid and less extensive than were the corresponding cultures in unsalted butter. While cheese was not tested in the same manner, negative phosphatase tests were consistently obtained on ripened Cheddar cheese manufactured from pasteurized milk, indicating that there is less chance of phosphatase production in cheese than in butter.

A study of some factors influencing the phosphatase reaction of flash pasteurized cream and butter made from it, W. J. WILEY, F. S. J. NEWMAN, and H. R. WHITEHEAD (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 2, pp. 121-128).—Cream which was flash-pasteurized in a high-temperature vacuum pasteurizer (Vacreator) consistently showed a very low, though seldom negative, phosphatase value. Salted butter manufactured from such cream

showed relatively high phosphatase values in the serum, indicating that the phosphatase test cannot be used on butter as a means of checking whether the initial cream has been properly flash-pasteurized. Unsalted butter did not give the characteristic high-phosphatase reaction. However, treating the butter with other substances such as sugar before drying in vacuo liberated the phosphatase, which apparently is bound in the cream in such a way that it escapes destruction during a very short heat treatment.

Application of the phosphatase test to special types and conditions of milk, F. J. DOAN and N. A. PERRY. (Pa. State Col.). (*Pa. Assoc. Dairy Sanit. Ann. Rpt.*, 17 (1941), pp. 69-74).—A résumé of research noted previously (E. S. R., 85, p. 660).

The relationship of fat to quality, and methods of standardizing the fat content, in Swiss cheese, G. P. SANDERS, R. R. FARRAR, F. FEUTZ, and R. E. HARDELL. (U. S. D. A. coop. Univ. Wis. and Ohio State Univ.). (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 639-648, figs. 3).—A study of the relationship of fat in the dry matter to quality for 844 cured Swiss cheeses indicated that the proportion of good cheese was higher among those which contained from 45 to 46 percent fat. An analysis of laboratory cheeses which have been described previously (E. S. R., 84, p. 241) showed similarly that those containing over 48 percent fat in the dry matter were of higher grade than those containing less than 45 percent. When the body of the cheese was relatively firm, the presence of a higher proportion of fat tended to improve the quality. A simple method for securing and pressing a sample of curd from the Swiss cheese kettle is described. Fat determinations on these samples estimated the fat in the dry matter of the cured cheese within 1 percent in over two-thirds of the cases. The use of this method in the more effective standardization of Swiss cheese is discussed.

Irradiation of cheese moulds and bacteriophage by ultra violet light, W. S. SUTTON (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 2, pp. 67-73, fig. 1).—The reported experiments were conducted by the Department of Agriculture of New South Wales, using a Sterilamp as the source of ultraviolet light. When agar plates inoculated with freshly prepared sugar suspensions of *Penicillium* isolated from cheese were irradiated for 17 hr., no growth occurred on those exposed at 3 in. or 1 ft., and growth was very scanty on those exposed at 6 ft. Irradiation for from 4 to 16 min. at a distance of 3 in. of moist or dry surfaces exposed to air-borne contamination effectively destroyed most of the molds present. Mold spore suspensions representing different genera showed susceptibility to destruction by irradiation in the following order: *Oidium*, *Penicillium* isolated from cheese rind, *Hormodendron*, *Macrosporium*, *Cladosporium*, and *Aspergillus*. The inability of the light to penetrate spore material to any depth of practical importance was demonstrated. The bacteriophage in milk cultures of *Streptococcus cremoris* was not affected by 1 hr. of irradiation, but that present in thin films or droplets of whey or in whey dust was completely inactivated by irradiation. These findings point to the possibility that mold growth on the rinds of maturing cheese may be prevented by irradiation, and that the incidence of starter failure might be greatly decreased by the use of effectively designed starter "irradiation hoods."

Compounds of phosphorus in milk powders, B. N. ACHARYA and S. C. DEVADATTA (*Jour. Univ. Bombay, n. ser.*, 9 (1941), No. 5, pp. 1-11).—This study of phosphorus compounds in milk powders gave evidence that, except for the absence of pyro and the easily hydrolyzable organic variety, the nature and amounts of the others were similar to those in fresh milk (E. S. R., 82, p. 811). All acid-soluble inorganic phosphorus was in the ortho condition, while the organic was in forms soluble and insoluble in barium hydroxide at pH 9.

Acid-insoluble phosphorus compounds existed as lipase or casein. Water-insoluble constituents consisted of tricalcium and magnesium phosphates and organic phosphorus.

Report of committee on sanitary control of ice cream, F. W. FABIAN ET AL. (*Jour. Milk Technol.*, 4 (1941), No. 2, pp. 100-104).—A further report of this committee (E. S. R., 83, p. 818).

Causes and prevention of foaming of lactic casein, W. R. MUMMERY (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 3A, pp. 121A-127A figs. 3).—Investigation of a number of factors which might contribute to the foaming of lactic casein indicated that the size of the mesh particles and seasonal effects were of little significance. The nature of the bacterial starter used in the manufacturing process appeared to influence the foaming propensity of the product. The foaming tendency increased with increasing temperature of the casein solution in the clay-casein slip used for paper coating, leading to the recommendation that a temperature range of 113°-125° F. may be employed in this process.

VETERINARY MEDICINE

[Work in animal pathology by the Indiana Station] (*Indiana Sta. Rpt. 1940*, pp. 94-96).—The work of the year (E. S. R., 84, p. 243) reported upon includes investigations by A. L. Delez, C. E. Michael, L. P. Doyle, E. E. Schnetzler, and C. Newton on the duration of immunity to Bang's disease in cows vaccinated as calves; brucellosis in bulls and swine; studies of abortions in herds free of Bang's disease reactors and of lesions produced by hog cholera virus; a study of the bacterial flora of hogs that have dysentery, of fowl paralysis, leucosis, and neoplastic conditions; hog cholera serum tests; and laboratory diagnoses of diseases of poultry and livestock.

[Work with animal diseases by the Nebraska Station] (*Nebraska Sta. Rpt. 1940*, pp. 52-55).—The work of the year briefly reported upon relates to certain phases of swine erysipelas and immunity studies of hog cholera.

[Work in animal parasitology by the North Carolina Station] (*North Carolina Sta. [Bien.] Rpt. 1939-40*, pp. 48, 51).—The work of the year (E. S. R., 82, p. 108) briefly reported upon includes the control of internal parasites in sheep by the use of a copper sulfate-nicotine sulfate mixture or phenothiazine and the effect of tapeworm infestations upon chickens.

[Work in animal pathology and parasitology by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt. 1940*, pp. 60-62).—This brief report (E. S. R., 83, p. 677) relates to work by J. S. Andrews on bloat colic in horses and cattle parasites.

A simple instrument for mincing tissue, C. OLSON, JR. (Mass. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 295-296, 297, fig. 1).

The germicidal action of cleaning agents—a study of a modification of Price's procedure, W. D. POHLE and L. S. STUART. (U. S. D. A.). (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 275-281, figs. 6).

Classification of *Corynebacterium equi*, D. W. BRUNER and P. R. EDWARDS (*Kentucky Sta. Bul. 414* (1941), pp. 89-107).—A study made of 34 cultures which on the basis of morphological, cultural, and biochemical tests had been classified as *C. equi* is reported. The major part of the work was devoted to a serological examination of the species, with some attention being given to its biochemical characteristics and pathogenicity. The organism was shown to be capable of utilizing glucose in its metabolic processes without producing acid or gas. It was pathogenic for chick embryos and possessed species-specific antigens which were demonstrable by complement-fixation tests but were not

apparent in other species of diphtheroids used for comparison. Type-specific antigens were demonstrated by agglutination tests or by precipitation tests in which acid extracts of the bacilli served as antigens. Twenty-nine of the 34 cultures studied belonged to 4 serologic groups. There were at least 19 serologic types. Cultures from the genital tract of mares, aborted equine fetuses, pneumonia of foals, and from the submaxillary lymph glands of hogs belonged to the same serologic group. A culture from a buffalo was demonstrated to be a member of the species and also a member of a group which in addition contained a strain from the os uteri of a mare and a strain from a foal. A list of 21 references to the literature cited is included.

The results of active immunization of human beings with a mixed heat-killed vaccine of *B[acillus] typhosus*, *Br[ucella] abortus*, and *Br. melitensis*, J. A. KOLMER, A. BONDI, JR., and A. M. RULE (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 258-267).

The results of active immunization of mice and rats with heat-killed vaccines of *Br. abortus* and *Br. melitensis*, J. A. KOLMER, A. BONDI, JR., and A. M. RULE (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 268-274).—Mice that had been actively immunized with subcutaneous injections of heat-killed vaccines of *Brucella abortus* and *B. melitensis* produced agglutinins and serum protection antibodies for the *Brucella*. "Of 29 mice immunized with a heat-killed vaccine of *B. abortus* and inoculated intra-abdominally with virulent *B. abortus*, 16 or 55.2 percent survived. Of 29 additional immunized mice inoculated with virulent *B. melitensis*, 16 or 55.2 percent likewise survived. Of 28 mice immunized with a heat-killed vaccine of *B. melitensis* and inoculated intra-abdominally with virulent *B. melitensis*, 22 or 78.6 percent survived. Of 30 additional immunized mice inoculated with virulent *B. abortus*, 16 or 53.3 percent survived, whereas of 17 unvaccinated control mice inoculated with *B. abortus*, none survived, as likewise with 17 unvaccinated controls inoculated with *B. melitensis*. Of 24 rats immunized with a heat-killed vaccine of *B. abortus* and inoculated intra-abdominally with virulent *B. abortus*, 15 or 62.6 percent survived, while of 12 inoculated with *B. melitensis*, 7 or 58.3 percent survived. Of 24 rats immunized with a heat-killed vaccine of *B. melitensis* and inoculated intra-abdominally with virulent *B. melitensis*, 22 or 91.7 percent survived, while of 12 inoculated with *B. abortus*, 8 or 66.6 percent survived. Of 16 unvaccinated control rats inoculated with *B. abortus*, 3 or 18.8 percent survived, while of 16 inoculated with *B. melitensis*, none survived."

A simple, differential medium for mastitis testing, J. G. DAVIS (*Dairy Indus.*, 6 (1941), No. 2, pp. 38-40, figs. 2).—The suggested medium consists of peptone 3 gm., Yeastrel 3, Lemco 3, lactose 5, precipitated chalk 10, and agar 15 gm., and separated milk 10 cc., bromocresol purple (0.04 percent solution) 50, and tap water 1,000 cc. This medium has proved particularly useful for plating fresh, aseptically drawn single-cow samples of milk. The differential value of the medium is fully discussed.

Incidence of members of the *Salmonella* group in rats, M. T. BARTRAM, H. WELCH, and M. OSTROLENK (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 222-226).

The in vitro action of immune serum on the larvae and adults of *Trichinella spiralis*, J. OLIVER-GONZÁLEZ. (Univ. P. R. et al.). (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 292-300, figs. 8).

Propagation of fowl- and pigeon-pox viruses in avian eggs and use of egg-cultivated viruses for immunization, C. A. BRANDLY (*Illinois Sta. Bul.* 478 (1941), pp. 309-336, figs. 7).—Following a review of the literature (pp. 313-316), investigations of the nature of the viruses causing pox in domestic fowl,

with reference to immunization procedures that have been under way at the station for many years, are reported. A propagation technic of proved value which, or an appropriate modification thereof, may be employed not only in research but also in the production of virus for use in disease prevention and control is described. This work has shown pox virus from chorioallantoic tissue to possess certain advantages over the skin lesion virus for immunization purposes. The results obtained in comparisons of single fowl pox vaccination and double vaccination with pigeon and fowl pox viruses suggest the desirability of further study of the multiple use of pigeon and fowl pox viruses for immunization against pox in chickens. Following preliminary vaccination with pigeon virus, the administration of fowl pox virus by the intravenous route apparently induced a greater degree of resistance to fowl pox exposure than did cutaneous administration.

Mechanical transmission of bovine anaplasmosis by the horsefly *Tabanus sulcifrons* (Macquart), J. C. LOTZE and M. J. YIENGST. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 323-326, fig. 1).—In experimental work, three susceptible bovine animals developed anaplasmosis in from 24 to 28 days after having been bitten by *T. sulcifrons* which had previously been allowed to feed on an infected bull. The results are considered to have shown that transmission is effected by this horsefly.

The pathology of the bovine kidney in vitamin A deficiency, R. F. LANGHAM, L. B. SHOLL, and E. T. HALLMAN. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 319-322, 323, figs. 21).—Report is made of 23 bovine animals studied to determine the effects of low vitamin A diets upon the kidneys. Microscopically the most conspicuous lesions were degenerative in character, such as cloudy swelling, hydropic degeneration, and necrosis. The proximal convoluted tubules showed the most extensive changes, followed by the collecting tubules, distal convoluted tubules, and Henle's loop. These cases also showed some inflammatory processes characterized by accumulations of lymphocytes and some macrophages, among which the tubules were atrophying and disappearing. Some cicatrization had taken place in these cases. Metaplasia with keratinization was rare.

The physiologic basis of therapy for ketosis in the ruminant, J. SAMPSON and L. E. BOLEY. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 327-332, figs. 2).—Following a review of the literature, accompanied by a list of 28 references, eight cases are reported to illustrate the effectiveness of dextrose or carbohydrate therapy for ketosis in cows. It is concluded that the liberal administration of dextrose or similar carbohydrate is the safest and most rational form of therapy for this affection in the ruminant. There appears to be little evidence to support the use of insulin, sodium bicarbonate, magnesium sulfate, or calcium gluconate. Calcium gluconate is indicated when ketosis is complicated by milk fever. Chloral hydrate therapy may be beneficial for ketosis in cows, but it should not be employed when the animal is in a weakened condition or is affected with both ketosis and milk fever. Further observations are desirable to determine the usefulness of anterior pituitary hormones for acetonemia in the cow. Carbohydrate therapy in the ruminant is most effective when treatment is begun in the early stage of the attack and intravenous and subcutaneous injections of dextrose solution are supplemented by large oral doses of sugar or molasses.

Efficiency of the microscopic examination of incubated milk samples for the detection of mastitis streptococci, A. L. KLECKNER (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 313-316, 317).—Work in which the efficiency of the microscopic examination of quarter samples of milk after incubation was compared

with the blood-agar plate method is reported. In cows with quarters free from mastitis streptococci, the microscopic test showed 2.9 percent false positives due to the presence of saprophytic streptococci in occasional samples. In quarter samples from cows with known infected quarters, the blood-agar plate method failed to detect mastitis streptococcus infection in 11.3 percent of the samples tested, making it approximately 87 percent efficient as compared with the approximate 100-percent efficiency (0.3 percent false negatives) of the microscopic examination. Out of 464 composite samples collected from 85 cows classed as noninfected on prior examinations of quarter samples, those from 5 cows showed evidence of infection on microscopic examination after incubation. This was confirmed by the isolation of *Streptococcus agalactiae* from the blood-agar plates made from quarter samples obtained from these cows shortly after the microscopic examinations were made. These were apparently new infections. Composite samples from known infected cows were all found to be infected on microscopic examination after incubation. The microscopic examination of milk samples after incubation is deemed a rapid, convenient, and reliable method for the detection of infection with mastitis streptococci and requires less labor and equipment than the blood-agar plate method.

The influence of an udder coccus upon the activity of mastitis streptococci in milk, W. D. POUNDEN and M. M. JOHNSON. (Univ. Wis. and U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 317-318).—Observations of an udder coccus capable of favorably influencing the activity of mastitis streptococci (*Streptococcus agalactiae*) in milk samples from a number of cows indicate that the activity of some may be greatly accentuated by the presence of the coccus.

The use of gramicidin and other agents for the elimination of the chronic form of bovine mastitis, R. B. LITTLE, R. J. DUBOS, R. D. HOTCHKISS, C. W. BEAN, and W. T. MILLER. (U. S. D. A. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 305-312).—In further work (E. S. R., 85, p. 251) on the eradication of the chronic form of bovine mastitis caused by *Streptococcus agalactiae* from a herd in which the milk from individual cows was culturally examined, the chemotherapeutic treatment of the early or mildly infected cows was found useful in the elimination of the infection. Of the 116 cows in the herd, the streptococci were eliminated by chemotherapeutic treatment from 12 of the 16 infected, thus necessitating the disposal of only 4 cows to eradicate the infection. Twenty-eight of the 32 infected quarters were treated with gramicidin, of which 23 were sterilized. Ten quarters were treated with novoxil, and the streptococci were eliminated from 5. Both bactericidal agents were injected directly into the infected quarter via the teat canal. In only one instance was a quarter severely damaged by gramicidin, a case unsuccessfully treated in which it was necessary to discontinue further medication. In general the reaction of the udder to the injection of from 20 to 80 mg. of the gramicidin-oil mixture was so mild that it was possible to repeat the treatments on the second or third day. In some instances from 20 to 40 mg. was injected daily on 4 consecutive days without causing a severe reaction.

The life history of *Oesophagostomum radiatum*, the common nodular worm of cattle, J. S. ANDREWS and J. F. MALDONADO (*Puerto Rico Univ. Sta. Res. Bul.* 2 (1941), pp. [2]+14, figs. 2; *Span. abs.*, pp. 13-14).—It having been shown by the authors (E. S. R., 85, p. 821) that the cases of so-called tropical diarrhea observed in Puerto Rican cattle were always attended by relatively large infections of one or more of six species of gastrointestinal parasites, a further investigation was conducted to ascertain the possible role of *O. radiatum* in the causa-

tion of this disease. "The free-living portion of the life cycle of this nematode was found to be similar to that of *Cooperia curticei*, *Trichostrongylus* spp., and of other oesophagostomes. The ensheathed third-stage infective larvae began to migrate from the charcoal-feces cultures held at room temperature (25° to 30° C.) on about the sixth day. On being swallowed by calves, the larvae complete the second ecdysis, pass with the ingesta to the ileum, cecum, or colon, where they penetrate the intestinal wall 24 to 48 hr. after infection. They remain within the intestinal wall about 10 days, growing from about 700 μ to 2 mm. in length. During this period the cervical glands undergo considerable development, and the provisional buccal capsule, the chief characteristic of the fourth-stage larvae, develops. Sexual differentiation is first indicated during this stage by the position of the genital primordium which in the female moves posteriorly. On about the eighth or ninth day the larvae undergo the third ecdysis, becoming fourth-stage larvae, and return to the lumen of the intestine on about the tenth day. Here in the cecum and colon they continue their development without again entering the mucosa. On the nineteenth day after infection the fourth-stage larvae had grown to a length of approximately 4.5 mm., and a few of them had completed the fourth ecdysis, thus becoming fifth-stage or adult nematodes. During the fourth stage the reproductive systems of both sexes grow rapidly, and the adult buccal capsule forms. The males and females then grow to about 13.6 and 17.1 mm., respectively, mature, mate, and the females lay eggs which are found in the feces of the host 37 to 41 days after infection." The data were compared with those obtained by other investigators from studies on species of *Oesophagostomum* parasitic in other domestic animals, and no marked differences noted.

A cobalt deficiency disease observed in some Michigan dairy cattle, A. C. BALTZER, B. J. KILLHAM, C. W. DUNCAN, and C. F. HUFFMAN (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 68-70).—A disease of dairy cattle that occurs in the northern counties of Michigan that border on Lakes Michigan and Huron, and known locally as "Grand Traverse or Lake Shore Disease," has been shown to result from a cobalt deficiency in the food. The symptoms of the disease are well defined and consist of progressive debility, anorexia, a marked decrease or cessation of milk flow, depraved appetite, and general emaciation. The hemoglobin values of the severely emaciated cows examined varied between 6 and 8 gm. per 100 cc., whereas the hemoglobin values of the mildly affected cows varied from 8 to 10 gm. In nearly all cases the hemoglobin values decreased 10 to 20 percent following administration of cobalt before the values turned upward. Hemoglobin regeneration was not so responsive to cobalt supplementation as was desired, but the general response of the cows in appetite, appearance, and increasing milk production was very satisfactory. Preliminary results from hay samples obtained from affected farms show that they contained from one-third to one-half as much cobalt as did hays from unaffected farms. Biochemical investigations revealed no evidence of ketosis or phosphorus deficiency.

The bacterial flora and disinfection of teat cups, J. R. HAY. (Univ. Del.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 297-304).—The details of experiments conducted are reported at length in seven tables. Sixty-five animals on a farm where mastitis had increased during the preceding 8 mo. were milked by a machine. Rinsing the teat cups in chlorine solution was found to be inadequate in removing the *Streptococcus agalactiae* from the teat cups. Although the numbers of viable bacteria were greatly reduced when the teat cups were rinsed in clear water followed by chlorine solution, the method did not free the cups

completely from *S. agalactiae*. The use of steam and chlorine rinse of the cups proved to be the most efficient method of sterilization. From the experimental data, it is suggested that unless the teat cups are subjected to proper cleansing and sterilization they may serve as important factors in the spread of bovine mastitis.

Sulfapyridine in cattle: A contribution to its pharmacology, I. A. KLEIN, A. L. KLECKNER, and R. O. BILTZ (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 333-339, 340, figs. 2).—There being no available information on the action of sulfapyridine on the bovine, it was administered in a drench to six cows in three experiments to determine the quantity that can be administered without producing toxic effects, the time required to attain a concentration in the blood adequate for therapeutic effect, and how frequently the drug has to be administered to maintain this level with the least fluctuation. The drug was given in daily doses of 4, 5, 6, 7, 8, and 9 gm. per 100 lb. of body weight. "On a daily dose of 4 gm. per 100 lb. of body weight for 48 hr., a blood concentration of free sulfapyridine within the level of 3 to 6 mg. per 100 cc. of blood, the concentration found therapeutically effective for man, was attained in the individual cows in 12 to 34 hr. after the initial dose was given. A maximum concentration of 3.6 to 4.2 mg. was attained in 32 to 44 hr. When daily doses of 5 and 6 gm. per 100 lb. of body weight were administered for 6 days, the free sulfapyridine in the blood reached the 3- to 6-mg. level in 12 to 26 hr. The blood concentration continued to increase until the middle of the sixth day, when a maximum of 11.6 to 13 mg. was attained, indicating that the drug is accumulative. On daily doses of 7, 8, and 9 gm. per 100 lb. of body weight administered for 6 days, the 3- to 6-mg. blood level of free sulfapyridine was obtained in 9 to 38 hr. The cow on the 9-gm. dosage attained a maximum blood level of 14.4 mg. on the fifth day. The maximum of the cows on the 7- and 8-gm. dosage was no higher than that of the cows on the 5- and 6-gm. dosage, but was attained 1 day earlier in the cow on the 8-gm. dosage. The concentration of free sulfapyridine in the milk of the cows on the 7-, 8-, and 9-gm. dosage was also determined and was found to be 1.8, 1.2, and 3.7 mg. lower, respectively, than in the blood.

"The various daily doses were administered in fractional doses on different schedules. The sulfapyridine blood level rose most rapidly the first day when the daily dose was given in four fractions at intervals of 4 hr., but also had the greatest drop in the interval between the daily doses. There was less fluctuation of the sulfapyridine level when the daily dose was given in five fractions at 4-hr. intervals or in three fractions at intervals of 8 hr. Undesirable effects were observed in all of the cows from all of the doses administered. Loss of appetite, constipation, and decrease in milk production occurred in all of them, but these conditions disappeared in a day or two after the last dose was given. One cow developed urticarialike swellings in the skin which cleared up in the 2 days following the last dose. The temperature was not affected, and no symptoms of urinary disturbance or other serious toxic effects reported in man were observed. There was no effect on the red cells or hemoglobin content of the blood. The total white cell count increased in all but one cow. The percentage of lymphocytes decreased, while the percentage of neutrophils increased."

Abscesses affecting the central nervous system of sheep, F. E. HULL and E. L. TAYLOR. (*Ky. Expt. Sta.*). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 356-357, fig. 1).—The results are reported of observations during the past few years of several cases of paralysis in sheep in which autopsies revealed abscesses in the central nervous system.

Further observations on the life cycle and incidence of the sheep bot *Oestrus ovis* in New Mexico and Texas, N. G. COBBETT and W. C. MITCHELL. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 358-366).—Report is made of further work (E. S. R., 69, p. 394) conducted on control measures for the sheep botfly, additional observations having been made of the various stages in the life cycle of the parasite. Year around post-mortem examinations were made of the head cavities of numerous New Mexico and Texas sheep, including animals of all ages from newly born lambs to aged sheep. The details are presented in five tables.

In west Texas, where the winters are moderate, the larvae of the sheep botfly continued to develop to maturity in the heads of sheep and were expelled by the host animals the year around. In northeastern New Mexico, where the winters are cold, the development of the larvae in the heads of sheep ceased during the fall and winter. The larval infestation in the heads of New Mexico sheep during such seasons consisted chiefly of first-stage larvae located in the nasal passages. These minute larvae remained quiescent on the nasal mucosa and did not migrate to the frontal sinuses of the host animals for further development until the following spring and summer. Thus, the perpetuation of the sheep botfly was assured in the area where the winters are too cold for the survival of the extra host stages of its life cycle.

Evidence was found to show that the average female sheep botfly may be capable of infesting many sheep with larvae. The dissection of 18 such flies under a microscope showed that the average female botfly carried approximately 500 ova.

Failure of natural *Vibrio fetus* infection to carry over in ewes, J. F. RYFF. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 367-368).—Extensive *V. fetus* infection in a Michigan flock of 79 sheep, as indicated by recovery of the organism from 4 aborted lambs, a positive agglutination test in 1:25 dilution in 37 sheep, and the loss of 37 lambs from 28 ewes due to abortions, stillbirths, or weakness, was not carried over to the following lambing season. Ninety-six viable lambs were secured and only 5 were lost from 80 ewes in 1941, although the animals were kept on the same ground and received feed and water from the same source as before.

***Corynebacterium equi* (Magnusson, 1923) in the submaxillary lymph nodes of swine, A. G. KARLSON, H. E. MOSES, and W. H. FELDMAN** (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 243-251, figs. 2).—The incidence of *C. equi* in tuberculous and nontuberculous swine has been found to be essentially the same. The identification of *C. equi* cannot be definitely established by microscopic examination and appearance of the colony. The acidfast character of the micro-organism is doubtful and appears to be an undependable criterion for purposes of identification. Agglutination reactions cannot be used to identify *C. equi* because the reactions are type-specific and not species-specific. Methods of identifying *C. equi* should include a study of reactions on differential mediums and also complement-fixation tests, using antigens that have been extracted with acid to remove type-specific fractions. The resistance of *C. equi* to oxalic acid and sodium hydroxide is unusual for a nonsporulating and nonacidfast micro-organisms. Two strains of *C. equi* were apparently nonpathogenic for young swine on a single exposure when administered by mixing large quantities of young cultures with the feed.

Pig anemia and hog-cholera immunity, P. H. VARDIMAN, F. M. BOLIN, and A. S. SEVERSON. (N. Dak. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 354-355, figs. 4).—The experiments reported indicate that pig anemia

does not destroy the passive immunity to hog cholera which pigs receive from their immune mothers.

Studies on immunization in equine infectious anemia, C. D. STEIN and O. L. OSTEEEN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 344-348, 349).—Inactivated tissue vaccines prepared from formalized brain or spleen tissue, chloroform-treated brain tissue, crystal-violet and phenol-treated defibrinated blood or spleen tissue, and chemically or heat-treated blood plasma failed to protect horses vaccinated with large amounts of the vaccines against exposure to the virus of infectious anemia. None of the vaccines produced infectious anemia in any of the vaccinated horses, indicating their freedom from virus. The apparently virus-free pseudoglobulin and albumin fractions from virulent plasma likewise had no value as immunizing agents. In attempts to attenuate the virus, it remained fully virulent after desiccation for 2 weeks to 9 mo., while attempts to attenuate it by chemicals resulted in some modification; the incubation period was prolonged, but the virus remained virulent and therefore could not be used as a vaccine. Attempts to produce an immune serum by hyperimmunization of a carrier with large amounts of virulent serum were likewise unsuccessful.

Comparative susceptibility of wild and domestic birds and animals to the western virus of equine encephalomyelitis (Br. strain) in California, B. F. HOWITT. (Univ. Calif.). (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 177-187).—Attempts to detect the western type of the equine encephalomyelitis virus in wild birds and mammals taken at random in California from both endemic and noninfected areas through intracerebral inoculation of young white mice, together with an estimation of the relative susceptibility of certain wild birds and mammals and domestic fowl, are reported upon. The results of neutralization tests on serums of domestic fowl and quail and the effect of inoculating fowl with small amounts of virus are also reported, with the details given in tables. A preliminary report has been noted (*E. S. R.*, 83, p. 819). The examinations made of the brains of 43 wild mammals and birds representing 144 different species failed to reveal the presence of the virus. Gambel sparrow (*Zonotrichia leucophrys gambeli*), English sparrow (*Passer domesticus*), quail (*Lophortyx californica* subsp.), junco (*Junco oreganus* subsp.), and thrasher (*Toxostoma lecontei lecontei*) were all susceptible to intracerebral inoculation of the new Bray strain of the western form of the virus, even to dilution of 10^{-6} for the first 3 species. "The Richardson squirrel (*Citellus richardsonii* subsp.), cotton (*Sigmodon hispidus texianus* and *eremicus*) and kangaroo rats (*Dipodomys heermanni* subsp.), and 6 species of wild mice (*Reithrodontomys megalotis*, *Microtus montanus*, *M. californicus*, *M. mordax*, *Peromyscus maniculatus*) succumbed to 10^{-6} and 10^{-7} dilutions, respectively. Wood rats (*Neotoma fuscipes*), puppies, and 2 species of wild rabbits (*Sylvilagus bachmani* subsp. and *S. audubonii*) were also susceptible. Domestic fowl varied in their reactions to the virus, ducks and young turkeys usually succumbing to 10^{-4} dilutions, pigeons and young chicks to 10^{-6} or 10^{-7} , respectively. Leghorn pullets and old hens were the most resistant of all barnyard fowl tested, the resistance varying more with the age than the locality or the presence of neutralizing antibodies. Frogs were unaffected by the virus.

"All birds resisting one intracerebral inoculation, even of highly dilute virus, were immune to a second stronger dose, and most of them developed neutralizing antibodies in 5 to 7 days, which if weak were enhanced after the second injection. Virus could be recovered irregularly from the blood of inoculated fowl, even though they failed to show clinical symptoms of the disease. Neutralizing antibodies may appear in the serum of resistant fowl very soon after inoculation of virus and may also be present at time of or before death."

The results are said to be in agreement with those reported by Davis (E. S. R., 84, p. 250).

Attempts to transmit the virus of St. Louis encephalitis to newly hatched chicks, S. E. SULKIN, C. G. HARFORD, and J. BRONFENBRENNER (*Jour. Infect. Diseases*, 67 (1940), No. 3, pp. 252-257).—In the experiments reported, the details of which are given in five tables, attempts to establish either apparent or unapparent infection with encephalitis virus in newly hatched chicks were unsuccessful, and it is considered doubtful whether the chick could serve as a reservoir of the virus in nature.

Malignant melanomas of horses and mules, R. A. RUNNELLS and E. A. BENBROOK. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 340-343, 344, figs. 3).

The effects of kidney damage upon the nitrogenous constituents of dog's blood and upon the specific gravity of the urine, J. B. ALLISON, M. L. MORRIS, D. F. GREEN, and H. O. DRESKIN. (Rutgers Univ. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 349-351, fig. 1).

Some observations on canine nephritis, L. B. SHOLL, R. F. LANGHAM, and W. T. S. THORP. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 769, pp. 295-300, 301, figs. 8).

Newer aspects of the lungworm (Crenosoma) in foxes, M. HOBMAIER. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 352-353, 354).—The author has shown that the lungworm *C. mephitidis*, naturally found in skunks, can be raised in young dogs and in silver foxes. All of four experimental foxes died during the fourth week after infection from causes not fully understood. First-stage larvae of *C. mephitidis* resist drying for several weeks. Auxillary hosts for this parasite are slug-feeding snakes (garter snakes).

What research has accomplished in modern poultry production, E. JUNGHERR. ([Conn.] Storrs Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 259-261).

Poultry disease, E. JUNGHERR. (Univ. Conn.). (*Northeast. Poultry Prod. Council, Ann. Mtg. Proc.*, 1940, pp. 35-40).

Effect of formaldehyde fumigation on mortality of chick embryos, W. M. INSKO, JR., D. G. STEELE, and C. M. HINTON (*Kentucky Sta. Bul.* 416 (1941), pp. 117-138).—Fumigation experiments were undertaken with a view to (1) determining the strength at which the fumigant can be used without mortality losses becoming too great for the treatment to be practical and (2) detecting the embryonic stages at which susceptibility to formaldehyde is greatest. The work involved the fumigation of incubating eggs in the range between 3 × and 7 × normal concentration of fumigant, and within this range there was a positive relationship between concentration of fumigant and mortality of embryos. Embryo losses were not great enough to be of practical importance, however, until the concentration of fumigant was more than 4 × normal. Fumigation at normal concentration—about 35 cc. formalin per 100 cu. ft. of incubator space—has been shown by several workers to be relatively harmless to the chick embryo at any stage of incubation. The early "critical period of incubation," the second and third days, was the most critical period in the fumigation of eggs. The use of ammonium hydroxide following fumigation seemed to be more effective in preventing embryo mortality as the concentration of formaldehyde was increased. The chief justification for its use is to shorten the disagreeable effects of fumigation.

Transmission experiments with iritis of fowls, C. D. LEE and H. L. WILCKE. (Iowa State Col. and U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 292-294).—In this preliminary account, the authors report upon transmission

experiments and field observations of spontaneous outbreaks extending over a period of several years. The term iritis is used by the authors to designate one type of the range-paralysis complex. "Eighty percent of the chicks hatched from iritis dams and sires and raised in isolation died from some form of the range-paralysis complex during a 14-mo. period. Approximately 70 percent of the chicks hatched from normal males and iritis females died of some form of the range-paralysis complex during a 14-mo. period. Only 15 percent of the birds hatched from iritis males and normal females died of the fowl-paralysis complex. Twenty percent of the chicks inoculated with ovarian tissue of an iritis fowl succumbed to some form of fowl paralysis. Approximately 50 percent of the chicks inoculated with blood of a 13-month-old hen suffering from iritis became affected. Only one bird became affected with range paralysis when inoculated with testicular tissue from an iritis male. Forty percent of the birds inoculated with blood of the iritis male became affected. The infective agent was found present in day-old chicks hatched from iritis matings. These experiments indicate that iritis males and females are possible carriers of fowl paralysis and the disease is transmitted to their offspring. This may account for many field outbreaks of the disease to the offspring by way of the egg. The results tend to show unity of etiology of erythroleucosis, myeloid leucosis, lymphocytoma, iritis, and neurolyphomatosis gallinarum."

Transmission of fowl leucosis through chick embryos and young chicks, W. J. HALL, C. W. BEAN, and M. POLLARD. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 272-279, figs. 5).—Following a brief review of previous studies, accompanied by references, the procedure employed and the results of transmission experiments are reported, the details being given in table form. A field strain of neural lymphomatosis with leukemic tendencies after 17 serial passages through young chicks became an apparently pure leucosis type (known as strain A). This change was accompanied by a marked reduction in the incubation period as well as by an increase in the percentage of takes. Some evidence is presented which could indicate that leucosis (strain A) is filtrable. Leucosis, strain A, infected chick embryos only when inoculated intravenously. The disease was transmitted through chick embryos to chicks by either tissue suspensions or blood. Some evidence is furnished that passage through chick embryos caused some enrichment of the virus on further serial passage in chicks. Difficulty was experienced in serial passage of the virus through chick embryos.

Isolation of *Listeria* (*Listerella*) from the chicken, R. H. HURT, N. D. LEVINE, and R. GRAHAM. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 279-280).—The isolation from one of seven chickens in an Illinois flock of an organism, the biochemical reactions of which were similar to those of other cultures of the single species so far described, *L. monocytogenes*, is reported. Coryza, coccidiosis, iritis, and roundworm and tapeworm infestations also were found in the flock, and it is suggested that in this case the *Listeria* infection may have been secondary in nature.

Successful vaccination to prevent chicken pox and laryngotracheitis, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Northeast. Poultry Prod. Council, Ann. Mtg. Proc.*, 1940, pp. 5-15).

The pathology of so-called pullet disease, E. JUNGHER and J. M. LEVINE. ([Conn.] Storrs Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 261-271, figs. 9).—An epizootiologic, pathologic, and experimental study of a syndrome of young laying birds that occurs primarily in the North Atlantic and North Central States during the warm weather, commonly known as blue comb, pullet, summer, housing, unknown, new, X, XX, and choleralike disease

and contagious indigestion, is reported upon. As shown by data collected from 1931 to 1939, the disease reveals great variability with respect to symptomatology and pathologic features. It occurs usually soon after housing, but may be observed on range. On the average, 21.7 percent of the flock are affected, with an average mortality of 5.2 percent. The symptoms include a drop in the egg production, droopiness, cyanosis, dehydration, diarrhea or constipation, and occasionally pyrexia. "Pathologically the condition is characterized by focal necrosis of the liver, serous petechiae, enlargement and apparent injury of the pancreatic islands, patchy muscular dystrophy, and nephrotic changes in the glomeruli and tubuli of the kidneys. The quantitative changes in the blood constituents suggest uremia. Experimental production of renal gout in birds by injection of small doses of potassium dichromate is associated with cyanosis and microscopic liver and muscle lesions, a picture not unlike that of the spontaneous syndrome. Pullet disease is considered to resemble the endogenous toxemias in other animals and to represent essentially a uremic condition, the underlying causes of which must be studied further."

Paratyphoid infection of turkeys, B. S. POMEROY and R. FENSTERMACHER. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 285-291).—In an investigation conducted over a 5-yr. period, 136 cultures of *Salmonella* isolated from poults originating from 44 farms in Minnesota were studied serologically. This resulted in the isolation of the following types: *S. typhimurium*, *S. derby*, *S. montevideo*, *S. newington*, *S. bredeney*, *S. bareilly*, *S. anatum*, *S. senftenberg*, *S. worthington*, *S. minnesota*, *S. enteritidis*, *S. newport*, *S. give*, *S. oranienburg*, *S. wichita*, *S. eastbourne*, *S. chester*, *S. litchfield*, *S. meleagridis*, and *S. saint paul*. "*S. typhimurium* mixed with sterile feces and smeared on one-third of the outside of turkey eggs was able to penetrate the eggshell during incubation and invade the contents of the eggs. Eggs containing living embryos at the end of 2 weeks of incubation were inoculated with a saline suspension of *S. typhimurium*. Only 4 poults hatched from the 45 inoculated eggs, in comparison with 7 of the 15 control eggs that hatched living poults. The organism was still viable in infertile eggs which were maintained under incubation for the duration of the experiment, which was terminated at the end of 13 mo. Hatching eggs were inoculated in the air cell with a saline suspension of *S. typhimurium*. Only 3 poults hatched from the 100 inoculated eggs, as compared with 22 of the 50 saline-inoculated eggs and 28 of the 50 control eggs which were not inoculated."

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the Indiana Station**] (*Indiana Sta. Rpt. 1940*, pp. 18-20, 21-25, 26-27, figs. 3).—Topics reported upon are: Studies with plow trash shields, and low corn-cutting demonstrations, both by R. H. Wileman; control implements for Canada thistle and bindweed, by Wileman and O. C. Lee; the power requirements and European corn borer kill secured with the corn husker shredder, by Wileman, G. A. Ficht, and T. E. Hienton; seed-corn drying investigations, by Wileman and A. J. Ullstrup; the use of electricity in brooding chicks, by Hienton and W. P. Albright; the practicability of electric water heaters for Indiana farm dairies, by Hienton and J. M. Fore; refrigeration for the farm household and farm produce, by G. M. Redfield, Hienton, and R. L. Witz; a study of the use and practicability of electric heat for warming drinking water for livestock, by Hienton, Fore, and Witz; the use of electric heat in brooding early spring

farrowed pigs, by Hienton and C. M. Vestal; use of mechanical refrigeration for cooling and holding eggs on the farm, by W. B. Grizzard and G. W. Newell; mechanical refrigeration of milk with units driven by gasoline engines and electric motors, by Hienton and Grizzard; and the combined harvester thresher, atmospheric corrosion of wire and wire products, and hay-harvesting equipment, all by I. D. Mayer; observations on ventilation and insulation at the experimental dairy barn, by Mayer and J. H. Hilton; and practical hog houses for Indiana, by Mayer and Vestal.

[**Agricultural engineering investigations by the Nebraska Station.**] (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt.* [1940], pp. 55-59, 65-66).—This report records cost data on automatic water systems, water heating for livestock, mechanical equipment for the eradication of bindweed, insulated electric brooders in uninsulated poultry houses, use of infrared lamps for brooding chicks, and oil filters for internal combustion engines; and pump-irrigation work at the North Platte Substation.

Surface water supply of the United States, 1939, parts 2, 4, 6, 7, 8 (*U. S. Geol. Survey, Water-Supply Papers* 872 (1941), pp. IX+388, pl. 1; 874 (1940), pp. VI+213, pl. 1; 876 (1941), pp. XI+506, pl. 1; 877 (1940), pp. VII+379, pl. 1; 878 (1941), pp. IX+393, pl. 1).—These papers record measurements of stream flow for the year ended September 30, 1939, No. 872 covering the South Atlantic slope and eastern Gulf of Mexico basins, No. 874 the St. Lawrence River Basin, No. 876 the Missouri River Basin, No. 877 the lower Mississippi River Basin, and No. 878 the western Gulf of Mexico basins.

Surface water supply of Hawaii, July 1, 1938, to June 30, 1939 (*U. S. Geol. Survey, Water-Supply Paper* 885 (1941), pp. V+142).—This report presents measurements of stream and ditch flow in the Territory.

Ground water in Keith County, Nebraska, L. K. WENZEL and H. A. WAITE. (Coop. Univ. Nebr.). (*U. S. Geol. Survey, Water-Supply Paper* 848 (1941), pp. IV+68, pls. 8, figs. 2).—Abundant supplies of water are obtained from wells in all parts of the county and are derived chiefly from alluvial sand and gravel in the valleys of the rivers and from sand and gravel in the basal part of the Ogallala formation. The water is hard but otherwise does not have objectionable properties. The water table in Keith County stands about 200 ft. below the surface in most of the south upland and from 200 to 500 ft. below in the middle upland, is not far below the surface near the rivers and in depressions between sand hills on the north upland, but stands 100 ft. or more below the surface near the edge of valleys and below the higher land in the sand hills. The depths of the wells ranged from 8 to about 500 ft. and averaged about 147 ft. The average depth of water in the wells was about 21 ft.

This report contains sections on Platte Valley public power and irrigation district, Sutherland project, by E. E. Halmos; and central Nebraska public power and irrigation district, tricounty project, by G. E. Johnson.

Flood of August 1935 in the Muskingum River Basin, Ohio, C. V. YOUNGQUIST and W. B. LANGBEIN (*U. S. Geol. Survey, Water-Supply Paper* 869 (1941), pp. VI+118, pls. 8, figs. 23).—The flood reported upon followed a fall of more than 8 in. of rain over an area of 400 sq. miles during a 12-hr. period on August 6-7, 1935, and resulted in the largest general summer flood known in this basin. This report presents in more detail than would be practical in the regular surface water-supply papers comprehensive factual information on the stage and discharge at 27 points in the basin and the flood-crest stage at 193 points, together with pertinent data on previous floods, records for which on the main river extend back with decreasing completeness to 1847.

This report contains sections on meteorologic and hydrologic conditions, by W. E. Smith; and meteorology of the storm, by A. K. Showalter.

Observations on use of irrigation water in Coachella Valley, California, A. F. PILLSBURY (*California Sta. Bul. 649 (1941), pp. 48, figs. 6*).—This study was concerned mainly with soils planted to date and grapefruit trees and grapevines. It appears that from 4 to 7 in. of water can be stored in dry soils so planted in the Coachella Valley, without loss of excessive amounts by drainage. This would require application of from 5 to 9 in. depth. Frequency of irrigation can be estimated from the average monthly use shown in the tables, included in this bulletin, in conjunction with the application per irrigation.

The relative rates at which moisture is removed at various depths indicate that an average of about 90 percent of the effective roots of dates are in the first 4 ft. below a 5-in. mulch. An average of 60 percent is in the first 2 ft. Of grapefruit from about 85 to 95 percent of the roots appeared to be in the top 4 ft. below a 5-in. mulch. Of grapes about 65 percent of the roots, in the plot investigated, were in the first 3 ft. of soil below the 5-in. mulch. About 95 percent were in the first 6 ft. Irrigation efficiency being assumed to be 80 percent, the respective total annual applications of water required by these crops are estimated as 7.5, from 5 to 7, and 4.5 ft. of water. Some drainage is believed to be necessary to prevent toxic salt accumulations, but, in general, more than the necessary quantities of water appeared customarily to be used.

Design of small irrigation pipe lines, M. R. LEWIS. (Coop. U. S. D. A.). (*Oregon Sta. Cir. 142 (1941), pp. 7, figs. 3*).—This circular is concerned mainly with determination of the most economical pipe size for a given required discharge rate, the factors pointed out as most important being electric-power cost, over-all pumping-plant efficiency, pumping hours per season, pipe cost, and tax, interest, and depreciation rates. The circular contains three charts, all based on the formula for calculating frictionhead, $H=0.34 \frac{V^{1.9}}{D^{1.1}}$ for steel pipe from

4 to 6 yr. old, from which saving in frictionhead per 100 ft. of pipe by substituting the next larger pipe size, the frictionhead in feet per 60 ft. of pipe at from 6 to 400 gal. per minute discharge rate from pipe 0.75-in. standard size to 6-in. outside diameter, and the same per 40 ft. of pipe may be, respectively, read off; and tables giving, respectively, cost of energy for pumping in cents per foot-acre-foot and annual cost of pumping in cents per gallon-per-minute-foot unit. With respect to the last-named unit, it is noted that it differs from the foot-acre-foot unit in that it is a rate of flow times a head rather than a volume times a head, and that it is here used to express the product of the discharge rate through a given pipe line times the frictionhead in the pipe.

Irrigation requirement of arable Oregon soils, W. L. POWERS and M. R. LEWIS. (Coop. U. S. D. A. et al.). (*Oregon Sta. Bul. 394 (1941), pp. 40, figs. 7*).—This bulletin records data on duty of water obtained by the station and co-operating agencies during the past 30 yr. Definitions for some of the important terms are given, duty-of-water studies are described, and their values are discussed. The factors affecting net and gross duty are also listed and considered before the data are presented. In part, the contents are: Methods of net duty-of-water studies, factors affecting the net duty, additional factors affecting gross duty of water, interpretation of data, useful water capacity of irrigable soils, conversion of useful soil moisture from percentage to inches, irrigation requirement of the coastal drainage basin, irrigation requirement of Willamette Valley Basin soils, conclusion as to current economic irrigation requirement for Willamette Basin, mid-Columbia Basin drainage area, irrigation requirement

of Snake River drainage basin areas, irrigation requirement of Klamath, Lost River, and Goose Lake drainage areas, irrigation requirement of Great Basin drainage area, general considerations, and other investigations needed.

Precast tile beam floor, H. GIESE and C. T. BRIDGMAN (*Iowa Sta. Res. Bul. 286 (1941), pp. 197-282, figs. 74*).—This bulletin reports upon two series of tests, the first made with a beam tile as first conceived, and the second with a tile revised to eliminate the shortcomings of the first. In addition to the beam tests, several tests were made of slabs and completed floors to secure approval for construction purposes in several cities. From these tests and from extensive construction experience, design formulas and suggestions for procedure have been developed and are included. It was found, in part, that:

With one exception, all failures of the typical floor sections were caused by the yielding of the steel. The compression area of the section was stronger than the tension even though only $\frac{1}{2}$ in. of concrete topping was used. There were no shear, compression, or bond failures in the testing except in the section using the 1-in. round rods. Seven-eighths in. is the maximum diameter of the reinforcing rod which the beam tile used in these tests will accommodate. Span tile, 24 in. long, can be used in all cases except for heavy loading conditions or spans longer than 19 ft. Span tile, 4 in. deep, is satisfactory for most loading conditions. The cost per square foot of the reinforced tile floor increases as the length of span increases. The deflection at the design load, of spans under 20 ft., is much less than the allowable of $\frac{1}{360}$ of the span. The usual formulas for the design of reinforced concrete T-beams can be used for this type of reinforced tile floor.

All-wood gravel culture bench constructed of treated lumber, N. H. ALTER (*Ohio Sta. Bimo. Bul. 211 (1941), pp. 146-153, figs. 10*).—Construction of a bench 4 by 53 ft. is very briefly outlined. Photographs of various details, but no working drawings, are reproduced with the note. The bench was found to be easily assembled, and no leaks had occurred after 3 months' use, during which time satisfactory service for gravel culture was obtained. The author considers it doubtful, however, whether or not the design described can compete with others in cost of materials.

Homemade rubber tired wagons and trailers, H. H. DELONG (*South Dakota Sta. Bul. 349 (1941), pp. 31, figs. 23*).—This bulletin briefly describes a two-wheeled trailer, a rubber-tired farm wagon, a rubber-tired wagon with hydraulic lift, a heavy duty dual-wheeled trailer, and a caster-wheel trailer, all constructed from old car parts. Photographs and diagrammatic drawings show the vehicles made and some mechanical principles important in their successful design and operation. Used car wheels, axles, frames, and entire chassis gave good results. The 6-16 drop center rim welded to the old car wheel or hub was the most satisfactory size of tire rim. It holds a tire (1) sufficiently large for loads, (2) large enough for cushioning much of the road shock, and (3) easily and cheaply obtained. The wagon type of steering gave better trailing performance than the auto-type steering for fast road speeds. The two-wheeled light-car trailer gave best results when the load was balanced over the axle, and with a long tongue than with a short one. The common car hydraulic bumper jack proved adequate for the lift mechanism on farm trailers. The one-wheel caster-wheel trailer is suitable only for light loads up to 600-700 lb. This type of trailer was made both without springs and with a hinged fork-spring mounting.

In gasoline mileage tests at 30 miles per hour the two-wheel trailer with a 2,900-lb. load took 7 percent more fuel than the car alone, and the four-wheel trailer with a 5,470-lb. load took 22 percent more fuel than for the car

alone. Similar mileage tests at this and at higher and lower speeds were made on all the trailers described.

Methods of field curing hay, T. N. JONES, O. A. LEONARD, and I. E. HAMBLIN (*Mississippi Sta. Tech. Bul. 27 (1941), pp. 47, figs. 29*).—Windrowing alfalfa hay aids natural transpiration, resulting in a greater moisture loss in a day. Photomicrographs show a reopening of the stomata following windrowing 2 hr. after cutting. Double windrowing 2 or 3 hr. after cutting gives the hay a better color, a larger percentage of leaves, and a lower moisture content at the end of the day. The leaves of alfalfa plants were found to aid greatly in lowering the moisture content of the entire plant. They were also found to contain from 60 to 90 percent of the proteins and vitamins in hay. Light, increase in temperature, oxidative enzymes, copper, decrease in pH value, high relative humidity, and decrease in rate of drying were found to increase carotene loss from hays or hay plants.

Crushing large-stemmed hays, such as Johnson grass and soybeans, shortened curing time. Crushed hay could be stored with a carotene content higher than that of mowed hay, and was as rich as mowed hay in proteins, sugars and dextrin, ether extract, and ash.

A device for converting small cotton gins for use in delinting cotton seed, W. W. BALLARD. (Coop. U. S. D. A.). (*Georgia Sta. Cir. 129 (1941), pp. 8, figs. 5*).—To provide means for delinting, for experimental purposes, smaller quantities of seed than can be handled in commercial machines, the author devised mechanical attachments for converting the small 10- to 20-saw gin into a seed delinter. The parts required are: (1) A revolving float, or 4-in. cylinder, carrying four 0.75-in. angle-iron flanges, operating inside the roll box, to keep the seed roll spinning while the gin is in operation; (2) a special seed grid designed to prevent seed from being thrown out of the roll box until delinting has been completed; and (3) a curved baffle plate attached to the top of the roll box to reduce the feed opening and prevent bulging of the seed roll as it revolves. No permanent alteration to the equipment interfering with normal operation of the gin is involved. The special parts required for delinting may be easily removed and the standard parts replaced in a few minutes.

Control of noxious weeds by light burning and how to make a burner, G. W. BOYD and C. L. CORKINS (*Wyo. Agr. Col. Ext. Cir. 75 (1941), pp. 16, figs. 20*).—The failure of chemical weed killers to provide satisfactory eradication, especially from soils either tight in physical structure or high in fertility and located in an arid climate, led the authors to design weed burners of three types (one hand-operated and two motor-driven), all producing a very hot spreading flame from such cheap fuels as used crankcase oil, refinery discard, light crude oils, and furnace oil. All of the burners were designed to preheat the fuel in a loop or coil of tubing placed in the flame. Construction of these burners is partially described, the necessary parts are listed with their approximate cost, photographic illustrations of burners and parts are included, and directions for weed eradication by this method are given. It is considered that in many instances burning by the methods indicated will be cheaper than the use of chemicals and will effect more complete eradication.

Grain storage on the farm, T. E. LONG and M. G. CROSEY. (Coop. U. S. D. A.). (*North Dakota Sta. Bul. 302 (1941), pp. 68, figs. 54*).—This bulletin records the results of experiments with numerous types of bin construction and ventilation, weatherproofing, ratproofing, bracing against wind damage, effect of weather conditions on stored grain, etc. Horizontal ventilation flues were more effective than vertical flues, but no form of natural ventilation secured and maintained a moisture content low enough to prevent spoilage. Forced ventila-

tion through a large air drum in the center of the wheat mass was effective when a centrifugal (silo blower) fan was used 1 hr. each dry day to a total of 24 hr. of operation. The wheat moisture content was reduced from 15.1 to 13.5 percent in about 1 month, and the grain remained in good condition from August 1938 to April 1941.

The bulletin contains discussion of structural requirements for the safe storage of wheat, the selection and conditioning of wheat for storage, and precautions in storing wheat over a period of time, and has also a section on control of insects in stored grain by J. A. Munro.

Controlled-atmosphere storage of apples, R. M. SMOCK and A. VAN DOREN ([*New York*] *Cornell Sta. Bul.* 762 (1941), pp. 45, figs. 22).—The experiments reported upon covered several types of sealed-chamber construction, variations in carbon dioxide and oxygen percentages, effects of controlled-atmosphere storage on a number of horticultural varieties of apples, market life of the apples after removal from the storage chamber, effect on resistance to spoilage organisms, and other factors influencing the commercial practicability of the process.

A storage room for controlled-atmosphere storage should permit the leakage of not more than 10 percent, preferably not more than 5 percent, of the carbon dioxide content of its atmosphere during 24 hr. Details of wall-, floor-, and water-sealing construction are considered. The most suitable carbon dioxide concentration was found to be 5 percent, with the oxygen concentration reduced to 2 percent. The most suitable temperature appeared to be 40° F., giving a slight saving in refrigeration costs as compared with those of ordinary 32° cold storage. Reduction of the carbon dioxide concentration to 5 percent was effected by circulating the air through washing drums or scrubbers (which may be constructed from discarded oil drums) in which the air is drawn upward countercurrent to a spray of caustic soda solution, $\frac{1}{3}$ lb. per gallon, falling through a series of baffle plates. Gas analysis apparatus for determining the carbon dioxide and oxygen contents of the storage-room atmosphere is a part of the necessary equipment. Scald required more precaution for its prevention in controlled-atmosphere storage than in ordinary cold storage because of the restricted air circulation, but was controlled in the less susceptible varieties by the mixing of from $\frac{1}{4}$ to $\frac{1}{3}$ lb. of oiled paper with each bushel of fruit, the paper containing 15 percent of tasteless, odorless mineral oil. For effective atmosphere control the storage room should be filled with fruit.

McIntosh, the variety found best suited to controlled-atmosphere storage, could be kept several months longer than in ordinary cold storage, and at a cost of approximately from 9½ to 10 ct. per bushel in addition to ordinary cold-storage costs and exclusive of operating labor. The market life of the apples after removal from storage was much longer after controlled-atmosphere storage than after ordinary cold storage. Brown core or core flush and internal browning, frequently occurring in apples stored at 32°, can be avoided, in the McIntosh variety, at least, in 40° storage in a suitably controlled atmosphere; mold growth is retarded; and mice and rats cannot survive in such an atmosphere. By using both ordinary and controlled-atmosphere storage the operator can sell apples from harvesttime through June or later. For the present, however, the only variety which seems to justify this practice is McIntosh. Other varieties which respond, but not so remarkably as McIntosh, are Northwestern Greening, Twenty Ounce, Delicious, Rome Beauty, and Northern Spy.

Report of the Administrator of the Rural Electrification Administration, 1940, H. SLATTERY (*U. S. Dept. Agr., Rural Electrification Admin. Rpt., 1940, pp. 11+54*).—Among other topics taken up, this report deals with functions of the

R. E. A., the typical R. E. A. system, the electric cooperative, the work done by the R. E. A., current fiscal status of R. E. A. borrowers, payments of interest and principal, economic trends, new developments in rural electrification law, and State legislative developments.

Electrical sterilizing equipment for farm dairies, J. R. TAVERNETTI and K. F. McINTIRE (*California Sta. Bul.* 650 (1941), pp. 28, figs. 16).—Electrically operated dairy-equipment sterilizers have proved practical, have certain advantages over other types, and are commonly used. The self-contained sterilizer, with the steam generator and sterilizing cabinet as one unit, is the most economical in both initial and operating costs, but does not supply controlled steam. For the self-contained sterilizer, the heating element with the automatic device for turning it off when not immersed is advised. To prevent the burning out of one element will more than offset the additional cost (about \$15). The energy consumption of the various steam boilers available was found approximately the same. The accumulator boilers are less troublesome where hard water is used. A water softener should be put in with the instantaneous boilers when hard water is used. Advice concerning the setting up and operation of various types of sterilizer, size of cabinets with relation to number of cows, etc., is given, together with estimated power consumption and costs.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics and farm management by the Indiana Station, 1940] (*Indiana Sta. Rpt.* 1940, pp. 47-48, 61-65, 69-70, 78, 81, 82-83, 93, figs. 2).—Findings not otherwise noted are reported briefly as follows: By V. C. Manhart based on data from 7,454 farms as to sources of supply, market outlets, and utilization of milk; by J. C. Bottum as to the factors affecting farm income in central Indiana; by Bottum, F. V. Smith, L. S. Robertson, M. G. Smith, H. H. Stonaker, G. P. Walker, and T. M. Bushnell as to the costs of producing grains and hay; by E. C. Young and J. C. Dibble as to returns per hen and the factors affecting such returns in 38 poultry flocks in northeastern Indiana; by O. G. Lloyd and H. S. Morine as to the relation of tenure to farm income as shown by a summarization of 3,528 farm account books kept from 1929 to 1935 and as to the compensation by landlords to tenants for unexhausted improvements and by tenants to landlords for damages; by R. C. Brundage as to the marketing of woodland products; by C. L. Burkholder and T. E. Henton as to costs of power for spraying installations; by F. C. Gaylord and K. I. Fawcett as to marketing of tomatoes on a grade basis and the quality of canned tomatoes sold in the State; and by E. R. Menefee as to grades of eggs marketed and the relationship between quality and price, size, and cleanliness.

[Investigations in agricultural economics by the Michigan Station] (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 1, pp. 6-11, 23-31, 71-76, figs. 2).—The following articles on investigations are included: (1) Land-Use Problems in Cass County, by K. T. Wright (pp. 6-11). The trends in number, size of farms, crop acreages and production, livestock numbers and production, tenancy, farm practices, farm loans, tax delinquency, and school costs are discussed. (2) Survey of Farmers' Loan Accounts at Michigan Country Banks, by H. S. Patton (pp. 23-31). Using the findings in a study of the records of nine rural banks in seven type-of-farming areas for 900 farmers for the period 1928 to 1936 or 1937, the seasonal and cyclical variations in borrowings, the size and purpose of loans, and the liquidity of loans to farmers and the factors affecting it are discussed. (3) Farm Production, Disposition and Income from Milk from Michigan Farms, 1924-40, by O. Ulrey (pp. 71-76).

Tables and charts are included and briefly discussed showing by years 1924-40, the number of milk cows and the amount of milk production; milk processed into butter and milk utilized on the farms; milk sold as farm butter, cream, and whole milk; quantity, price, and value of milk sold as farm butter and as butterfat; quantity, price, and value of milk sold at wholesale, and of milk and cream sold at retail from farms; and the cash farm income, value of products consumed on farms, and gross farm income from dairy products.

[Investigations in agricultural economics by the North Carolina Station, 1939-40]. (Partly coop. U. S. D. A.). (*North Carolina Sta. [Bien.] Rpt. 1939-40, pp. 29, 57-60, fig. 1*).—Brief statements are included as to the relation of Federal grades and grades upon which companies purchase flue-cured tobacco; the benefits received by farm owners from the tax relief program of the State, with chart showing the relation of different laws to the tax rates per acre on farm land; condition of the houses of 114 families on badly eroded soil; the increase in net farm income due to use of soil conservation practices; bad leasing arrangements as a cause of poor land utilization; the means by which returns of low-income farmers may be increased; growth, financial status, losses, and assessments in Farmers' Mutual Insurance Companies; and the important changes in farming the Coastal Plain area during the past decade.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 211 (1941), pp. 154, 155*).—An article on Feed Sales in Ohio, by J. I. Falconer, includes tables showing the estimated tonnage of different commercial feeds reaching the Ohio retail trade for 1929, 1932, 1937, 1938, 1939, and 1940 (estimated), and the total annual feed sales 1929-40. The usual table of index numbers of production, prices, and income, by Falconer, is brought down through April 1941.

[Investigations in agricultural economics by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Rpt. 1940, pp. 15-19, 19-21*).—In addition to findings previously noted (E. S. R., 83, p. 689), brief statements are included as to (1) the cost of producing tomatoes, by R. Colón Torres and J. O. Morales; (2) the average yield and cost of production of coconuts on 24 farms, by Colón Torres and L. M. Géigel; (3) the costs of production, yields, and net returns on 140 cotton plantings, by Géigel and M. Hernández; (4) yields and labor income, 1934-38, on coffee farms, by E. del Toro, Jr., and D. Haddock; (5) prices of tobacco, 1907-38, by J. J. Serrallés, Jr., and M. Vélez, Jr.; (6) sources of credit for 157 tobacco farms, by S. L. Descartes and Morales; (7) volume of sales by street vendors, by S. Díaz Pacheco and J. R. Noguera; (8) size of farm and use of land for 150 farms in the northwestern section of the island, by Colón Torres; etc.

Report of the Chief of the Bureau of Agricultural Economics, 1940, H. R. TOLLEY (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1940, pp. 100*).—The work of the Bureau in phases of the National Defense program and in cooperation with State land-grant colleges and farmers in planning and carrying out programs for land use, wholesale markets, etc.; the research of the Bureau as to land use, taxes, interregional competition, land tenure, migration of farm population, rural youth, transportation, etc.; the Bureau as a service agency; and the building of national programs and policies are described and discussed.

[Economic Library Lists 21, 23-28] (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. Lists 21 (1941), pp. 13; 23, pp. 15; 24, pp. 40; 25, pp. 79; 26, pp. 54; 27, pp. 17; 28, pp. 15*).—The following lists of selected references include:

No. 21.—Delta County, Colorado, by H. B. Turner, 49 references.

No. 23.—Almonds, by L. O. Bercaw, 59 general references, 21 on diseases, and 20 on statistics for the industry, 1929-40.

No. 24.—Crop and Livestock Insurance, 1937–1940, by M. I. Herb, 199 references on the United States and foreign countries supplementing the bibliography on crop and livestock insurance (E. S. R., 76, p. 555). References to proposed legislation are not included.

No. 25.—Imperial County, California, by H. B. Turner, 282 references on the physical, agricultural, historical, and economic aspects, classified as General, Agriculture, Irrigation and Flood Control, and Geography and Geology.

No. 26.—Economic Aspects of Farm Tractor Operation, by N. G. Larson, 119 references 1935–March 1941 relating “primarily to the farm management and economic aspects of tractor use and operation, including tractor-drawn implements and attachments.” The references are limited so far as possible to studies of tractor operations on actual farms, especially small farms. References to studies of performance tests, mechanical improvements, rubber tires, fuels and other engineering studies of an experimental nature, the tractor in cotton culture, and the social effects of mechanization are omitted.

No. 27.—Leake and Union Counties, Mississippi, by H. B. Turner, 58 references.

No. 28.—Okfuskee County, Oklahoma, by H. B. Turner, 53 references.

Foreign Agriculture, [July–August 1941] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 5 (1941), Nos. 7, pp. 261–306, fig. 1; 8, pp. 307–349, fig. 1).—No. 7 includes the following articles: Agriculture in the São Paulo-Northern Paraná Region, by I. P. Keeler and R. F. Lanckenau² (pp. 263–280), discussing the principal areas of the two States, the principal crops, and types of livestock; Some Objectives and Problems of Price Control, by M. Ogdon (pp. 281–298), discussing the wartime problem of prices, the control of consumer prices, price fixing as a control of production, and production price problems and approaches to their solution; and Impact of War on the Japanese Cotton Textile Industry, by C. H. Barber (pp. 299–306), discussing the place of the cotton textile industry in the Japanese economy, the causes for the decline of the industry, the importance of Japanese market for American cotton, and recent measures of relief of the industry in Japan.

No. 8 includes two articles: Manchurian Agriculture Under Japanese Control, by W. I. Ladejinsky (pp. 309–340), discussing the characteristics of the agriculture, the colonization of Manchuria, the 5 and 10 yr. plans for agriculture, the control of agriculture, and the economic measures—supply of manufactured goods and bonuses for different crops, with an appraisal of the agricultural situation; and Tea Regulation, by L. Bacon (pp. 341–349), discussing the characteristics of the tea industry, the regulations, and voluntary restrictions and agreements, 1917–30, the International Tea Agreement, effective for 5 yr. beginning April 1, 1933, and wartime control, 1939–41.

State legislation for better land use (*U. S. Dept. Agr., 1941, pp. XIX+122*).—This special report of an interbureau committee of the Department, in addition to the introduction discussing the nature of the report, consists of nine chapters on: Rural zoning, State water laws, soil conservation districts, farm-tenancy law, the structure and function of rural local government, procedure for rural tax-delinquent lands, State land purchase for land use adjustment, management and development of State and county lands, and interrelation of measures affecting land use. “In each of its chapters, available material is analyzed in the same order, answering the questions: What are the outlines of the problem that has led the citizens of certain areas to take action through government? What are the main provisions of the statutes so far adopted? What considera-

² Reprinted, slightly abridged, *Bul. Pan Amer. Union*, 75 (1941), No. 10, pp. 570–585, figs. 6.

tions pertaining to policy, constitutionality, administrative efficiency, does this experience show to be pertinent to the drafting of a satisfactory statute?"

Working plans for permanent farms, G. K. RULE (*U. S. Dept. Agr., Misc. Pub. 411 (1940), pp. [2]+41, figs. 32*).—This is a popular discussion of the principles, objectives, and procedure in farm planning for soil conservation. Three sample farms in South Carolina, Texas, and Minnesota that have been mapped and planned are described.

Soil conservation districts in action on the land, G. K. RULE (*U. S. Dept. Agr., Misc. Pub. 448 (1941), pp. [2]+25, figs. 20*).—This is a popular bulletin describing the conditions existing in, and the organization, operation, and results in the Cedar Soil Conservation District in southwestern North Dakota and the Terre Rouge-Bodcaw District in southwestern Arkansas.

Small agricultural holdings in two industrial areas in Indiana, H. L. HAWLEY (*Indiana Sta. Bul. 460 (1941), pp. [2]+35, figs. 16*).—This bulletin is based on data secured in interviews with 189 urban workers living in Ross Township, Lake County, 139 such workers in Mt. Pleasant Township, Delaware County, and 113 employees of an industrial plant living in Muncie and in towns and the country surrounding Muncie. The characteristics—age, nationality, background, schooling, occupational characteristics, financial condition, etc.—of the farmers are described. Analysis is made of the sources and amounts of nonfarm and farm income, size of holdings, amount of farm and nonfarm labor, seasonal labor requirements on the farms, number and kinds of farm enterprises, sources of farm earnings, methods of marketing, tenure of holdings, income, travel required to reach nonfarm employment, investment in agricultural holdings, methods of acquiring holdings, costs of land and improvements, family expenses, etc. The taxes, schools, relief requirements, community life, etc. in the areas are discussed. Suggestions are made regarding the selecting of small agricultural holdings.

Twenty-two percent of the produce raised by the farms in Ross Township and 40 percent in Mt. Pleasant Township were sold. Returns for labor spent on farm enterprises averaged 3 cents per hour in Ross Township and 9 cents in Mt. Pleasant Township. The average distance to the nonfarm employment was 11.3 miles in Ross Township and 6.6 miles in Mt. Pleasant Township, and the average yearly costs of transportation \$105 and \$63, respectively. Seventy-five percent of the families studied in Ross Township, and 60 percent in Mt. Pleasant Township owned their homes, as compared with 44 percent and 33 percent respectively of the employees studied in Muncie, living in the city and in the small towns. Renting a small agricultural holding gave as high returns as owning. Building was as cheap as buying a home if the family was able to do the major part of the work. Farm earnings averaged 9.4 percent of the total family income for the agricultural holdings in Ross Township and 16.9 percent in Mt. Pleasant Township. The families in Ross Township were saving 17 percent (\$250) of their nonfarm incomes, and those in Mt. Pleasant Township 15 percent (\$200). The families of owners in Ross Township comprised 25 percent of the population and paid 4.6 percent of the taxes. In Mt. Pleasant Township they comprised 12 percent of the population and paid 2.5 percent of the taxes. The larger nonfarm incomes were associated with larger holdings.

An economic study of land classes, Blair County, Pennsylvania.—Progress report, W. E. KEEPPER. (Coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 413 (1941), pp. [2]+26, figs. 9*).—This is a preliminary report on the classification of lands of the county as to their present and possible future economic value in agriculture. On the basis of present use, size and condition of build-

ings, topography and elevation, nearness to market, and soils, the lands were divided into five classes—those adapted primarily to forest and recreational uses, those better fitted for such uses than for agriculture, those holding their own agriculturally, and three classes that will remain permanently in agriculture. The several classes are described, and the variations within classes, the intensity of farming, the capacity for use of farm credit, and assessments for taxes compared to appraised values are discussed.

Costs and returns from farm enterprises, P. S. WILLIAMSON ([*New York Cornell Sta. Bul.* 756 (1941), pp. 41, fig. 1).—Records kept by 75 farmers in 1939 are analyzed and some comparisons made with 1937 and 1938. Separate analyses are made of the costs, returns, and gains of different enterprises.

The averages found were: Receipts \$11,064, expenses \$9,049, increase in capital \$815, products used by other than farmers \$55, value of unpaid labor \$232, value of board furnished hired labor \$172, interest on farm capital \$1,459, labor income \$1,022, value of house rent and privileges \$566, value of operator's time \$885, and returns on net capital \$1,596 or 5.5 percent. The average annual costs were: Owned crop land \$3.65 per acre, permanent pasture \$2.42, rotation pasture \$5.32, fences 87 ct., and woodland \$4.98 (returns \$4.23). The average costs per farm were: Maintenance of buildings \$1,235, water systems \$93.37, months of labor on large farms 73, on medium farms 40, and on small farms 24. The average number of hours of work and costs per hour per horse were: 698 and 19 ct., those of tractors 469 and 49 ct., operating costs of trucks \$268.45 per year and 5.5 ct. per mile, and equipment costs \$568 per farm. The average cost of producing 100 lb. of milk was \$1.96, the receipts \$1.89, and the returns per hour of labor 25 ct. The net cost of raising a 27½-month-old heifer was \$125.31. The average gain or loss and returns per hour of labor in 1939 were: For hatching chicks \$2.57 per 100 and \$1.19, raising chicks —99 ct. per 100 and 29 ct., eggs 9 ct. per dozen and 27 ct., sheep —\$2.11 per head and —3 ct., feeder lambs —84 ct. per head and —18 ct., potatoes 16.8 ct. per bushel and 74 ct., cabbage \$7.13 per ton and 92 ct., canning-factory tomatoes \$1.99 per ton and 41 ct., canning-factory peas —\$6.46 per ton and 6 ct., dry beans —4 ct. per bushel and 30 ct., apples —19 ct. per bushel and 9 ct., peaches 9 ct. per bushel and 41 ct., pears 12 ct. per bushel and 46 ct., cherries —0.3 ct. per pound and 25 ct., alfalfa \$3.27 per ton and 93 ct., hay other than alfalfa —68 ct. per ton and 16 ct., corn silage net cost per ton \$4.33, corn for grain \$1.47 per acre and 32 ct., mixed spring grain 2 ct. per bushel and 34 ct., oats —\$1.98 per acre and 14 ct., barley —4 ct. per bushel and 21 ct., and wheat 18 ct. per bushel and 73 ct.

El costo del mantenimiento de animales y su relacion con el uso de la tierra en la costa noroeste y la zona tabacalera [The cost of production of animals and its relation to the use of land in the northwestern coastal and tobacco areas], F. DE JESUS (*Puerto Rico Univ. Sta. Bul.* 58 (1941), *Span. ed.*, pp. 34; *Eng. abs.*, pp. 32–34).—Data for the calendar year 1939 for 110 farms along the northwestern coast, and for the year ending March 31, 1940, for 90 farms in the tobacco region are analyzed.

The average size of farm was 48 cuerdas in the coastal area and 53 cuerdas in the tobacco area. In the coast area the pasture per animal unit averaged 1.91 cuerdas, and the pasture costs per animal unit averaged \$20.63 for the larger farms and \$15.74 for the smaller farms. The comparative figures for the tobacco area were 3.36 cuerdas, and \$11.13 and \$24.54, respectively. The expense of keeping a horse averaged approximately \$38, or 35 ct. per work day in both areas. The average annual cost and profit per dairy stock unit were \$42.33 and \$5.65, and \$34.91 and \$3.91, respectively, in the coastal and tobacco areas. The labor costs were \$16.50 and \$14.16, respectively. Approximately 250 hr. of

labor per animal unit were employed. Milk production per cow and price per quart of milk averaged 931 qt. and 6.5 ct., and 675 qt. and 7.7 ct., respectively, in the two areas. In the coast area, on farms with larger than average dairy enterprises the profits were \$7.16 per animal unit, the hours of labor 394, and the cost per unit \$23.44, as compared with 46 ct., 188 hr., and \$13.59 in the tobacco area. The average profit per animal unit was \$2.22 for the larger farms and \$7.41 for the smaller farms. The average cost of keeping an ox team was \$65.88 in the coast area and \$58.70 in the tobacco area. The average number of days worked and cost per day were 126 days and 52 ct., and 106 days and 55 ct., respectively.

Cost and efficiency in producing walnuts in western Oregon, G. W. KUHLMAN and C. E. SCHUSTER. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 396 (1941)*, pp. 59, figs. 12).—This is the third and final bulletin of a series on costs and efficiency of walnut and filbert production based on data collected from growers for the years 1929 and 1931–33, and on data as to costs of establishing new orchards for 1919–34. It describes the situation as to production, the trends in imports, exports and domestic consumption, prices, etc., for walnuts. Analysis is made of investment production costs and factors affecting yields, costs, and income. The findings apply especially to the years 1929 and 1931.

The average costs were 17.4 ct. per pound in 1929 with a yield of 335 lb. per acre, and 9.2 ct. in 1931 with a yield of 662 lb. Prices averaged 15.3 ct. and 12.5 ct. per pound. Of the average costs per acre in the two years, \$59.43, interest on capital investment comprised 49.7 percent, man labor 34.5 percent, materials, taxes, equipment depreciation, repairs, horse work, and miscellaneous costs 15.8 percent. Cash costs constituted 36 percent of the total costs. Sixty hr. of labor per acre were required, of which three-fourths were for harvesting. Yield was the major factor affecting costs. Hill orchards, as a whole, produced only 50 percent as large crops as those on bottom and valley land. Variety, failure to remove interplants when the trees matured, and too great and too small amount of cultivation resulted in lower incomes. Net farm income was directly proportionate to size of orchard, and there was only a slight relationship between size of orchard and efficiency of operations. Variety, grade, and size of nuts were the major factors affecting prices received.

The economic relationship between feeding and milk production in Rhode Island, J. L. TENNANT and H. C. FOWLER (*Rhode Island Sta. Bul. 279 (1941)*, pp. 23, figs. 9).—The records of about 6,000 cows enrolled in the Dairy Herd Improvement Associations during 1931–36, inclusive, were analyzed to determine the most profitable amounts of roughage and concentrates to feed dairy cows and to investigate the economy of growing more roughage in the State. The relation of feed input to milk output, grain fed and milk produced, value of pasture, barn feeding, intensity of dairying in the State and related factors, and the economics of growing roughage are discussed.

The average yearly production per cow of 4 percent fat-corrected milk increased about 90 lb. for each 100 lb. increase in grain fed. Holstein cows producing from 8,000 to 10,000 lb. of milk when barn-fed throughout the year consumed 1,790 lb. more grain and 3,900 lb. more hay equivalent than did similar cows that had good pasture for 6 mo. Holstein cows receiving 2,420 lb. of grain and 5,300 lb. of hay equivalent in addition to pasture produced more milk than similar cows fed 3,110 lb. of grain and 4,200 lb. of hay equivalent.

Broiler production and marketing in northwestern Arkansas, W. T. WILSON and R. M. SMITH (*Arkansas Sta. Bul. 412 (1941)*, pp. 40, figs. 13).—Data concerning the year 1939 regarding the industry in Benton and Washington counties were obtained from 17 hatcherymen and feed dealers, 120 broiler pro-

ducers, and 21 buyers and shippers, and from personal interviews with 120 producers who raised 214 broods totaling approximately 407,900 chicks started. The term "broiler" as used in the bulletin includes all weights of young chickens marketed as live poultry. Analysis is made of the total investment in land and buildings, cost, gross income, profits, and the factors affecting profits. The management and marketing practices, prices received, and credit and insurance costs are described and comparisons made of the 24 most and 24 least profitable enterprises.

Net returns—profits and wages allowed for family labor—ranged from minus \$465 to \$2,396, averaging \$372. "Spring" chickens (4 lb. or more) gave an average profit of 4.5 ct. per hour, while the sale of broilers (less than 2½ lb.) resulted in a loss of 3.8 ct. per pound. Feed requirements per pound produced ranged from 3.9 to 4.6 lb., averaging 4.4 lb. Cost per pound of feed averaged 7 ct. for home-mixed feeds and 9.7 ct. for imported commercial feeds supplemented with condensed milk. For the 24 least profitable farms, cost of feed per pound produced was 10.7 ct., sales price per pound 15.6 ct., value of family labor 2½ ct. per pound, mortality 20 percent, and the average weight produced 3 lb., as compared with 8.2 ct., 17.9 ct., 1.1 ct., 12 percent, and 3.4 lb. respectively, for the 24 most profitable farms.

Trading in wool top futures (*U. S. Dept. Agr. Cir. 604 (1941), pp. 111, figs. 14*).—This is the first of two bulletins to be based on analysis of wool top futures trading on the New York Wool Top Exchange, known officially as the Wool Associates of the New York Cotton Exchange, Inc. It covers the periods May 1931, the date of organization of Wool Top Exchange, to July 31, 1939, with supplementary data for the period August 1 to December 31, 1939. By the Act of April 7, 1938, the provisions of the Commodity Exchange Act were made applicable to wool tops. The organization of the Wool Top Exchange, the exchanges in other countries, the margin requirements, the growth of the market, the foreign trading on the American market and American trading on foreign markets, and the undesirable practices on the exchange are described and discussed. Analysis is made of the price relationships of wool top futures, spot tops, and raw wool; the commitments in top futures, August 31, 1936, and June 30, 1938; relation of futures commitments and price movements; the exit of traders from the market and the outcome of operations of such traders; and profits and losses of different types of traders, and futures commission and clearing operations.

Marketing of milk products in Lenawee County, Michigan, O. ULREY. (Coop. U. S. D. A.). (*Michigan Sta. Spec. Bul. 310 (1941), pp. 42, figs. 7*).—The milk production in the county and its trends, the consumption on farms in urban areas and for manufactured products, the utilization by dairy plants, the marketing outlets for fluid milk and butterfat and for manufactured milk, the delivery to dairy plants, the central market outlets, the inspection of milk and cream by different cities, and the organization and functions of the Michigan Producers Dairy Company are described and discussed. The local and inter-regional competition for milk, the local hauling routes and rates, the prices and quality of milk, and the inspection are discussed.

From 1924–36 the number of cows in the county decreased 4 percent but the production of milk increased 7 percent. Milk plants in the county in 1936 reported that 44 percent of the milk received was used for out-of-State shipments, 19 percent for evaporated milk, 11 percent for creamery butter, and 11 percent for fluid milk. Only about 40 percent of the milk handled by the plant came from the county. There was considerable duplication in milk routes. In Hudson and Medina Townships with 176 miles of roads 45 miles were served by 2

trucks, 31 miles by 3 trucks, 17 miles by 4 trucks, 12 miles by 5 trucks, and 3 miles each by 6 and 7 trucks. With no duplication of travel the trucks would have traveled 142 miles instead of 310 miles. Carload shipments to eastern markets of cream for table use and manufacture increased steadily during the period 1930-36. Duplication of inspection, conflicting requirements, and refusal to reciprocate added greatly to the cost of marketing milk and operated to the competitive advantage and disadvantage of particular markets.

The Portland metropolitan milk market, D. B. DELOACH and R. A. STEINER (*Oregon Sta. Bul.* 388 (1941), pp. 36, figs. 4).—This is a report to the Oregon Milk Control Board and is a companion report to Bulletin 375 (E. S. R., 85, p. 552). It discusses the Portland market—population, consumer buying habits, milk and cream consumption, etc.—the marketing channels, the milkshed, the production trends, the production costs—land values, investments in buildings and equipment, size of herds, butterfat production per cow, labor costs, etc.—and the trade problems—quotas, pooling equalization, marketing costs, cream prices, etc.

More than 50 percent of the retail route consumers take 1 qt. of milk per day, and approximately 23 percent 1 qt. every other day. Butterfat sales in the form of cream have been declining for several years. Daily per capita consumption of milk in 1939 was 0.86 pt. The retail price of 4 percent milk on April 1, 1940, was 95 percent of the 1923-25 average. The sales are handled by 18 distributors and 84 producer-distributors. Approximately 99 percent of the B-grade milk for distribution is obtained through producers' cooperative marketing associations. Approximately 80 percent of the milk supply is obtained within a 20-mile radius from the center of the city. Total production of milk increased slightly over 9 percent from December 1936 to December 1939, but the reported sales in the bottle and can trade decreased more than 3 percent. While approximately 75 percent of the milk is produced by dairies with less than 30 cows, less than 13 percent of the herds have less than 10 cows. The authors reached the following conclusions: (1) The home delivery price on 1- and 2-qt. deliveries of 4 percent butterfat milk is in line with present costs; (2) a quantity discount on purchase of 3 qt. or more and a store differential on milk sold over the counter are justified on the basis of lower marketing costs; (3) the price of 5 percent milk should not exceed that for 4 percent milk by more than 1 ct. a quart; (4) the price of cream is too high compared with that for milk; (5) the legal minimum wholesale price structure has been ignored by a majority of the members of the industry; and (6) a study of the cost of marketing milk and cream should be undertaken by the Milk Control Board.

The compression of cotton, and related problems, J. W. WRIGHT and C. A. BENNETT (*U. S. Dept. Agr., Agr. Market. Serv. and Bur. Agr. Chem. and Engin.*, 1940, pp. 68, figs. 14).—The development, distribution, and organization of the industry, the types of equipment, volume of cotton handled, rates charged, distribution of the cotton from the compresses, and the special problems associated with compression are discussed.

Refrigerated-storage plants in the Eastern Panhandle of West Virginia, D. VOLKIN and M. A. ABRAHAMSEN (*West Virginia Sta. Mimeog. Cir.* 43 (1940), pp. [2]+23, fig. 1).—This circular, based chiefly on data obtained from interviews and records of 10 plants, deals with the construction, maintenance, and operating costs, and the economic considerations in operation. The factors contributing to the development of such plants, the types of plants, operating policies, etc., are discussed, and analysis made of the relationship of investment to total operating expenses, volume of fruit held in storage to current expenses, and operating expenses per bushel to storage utilization.

Expenses, income, and dividends of Oklahoma and Texas cooperative cotton gins, J. S. BURGESS, JR., and O. T. WEAVER (*U. S. Dept. Agr., Farm Credit Admin., Coop. Res. and Serv. Div. Bul. 41 (1940), pp. VI+62, figs. 14*).—This study was based primarily on the annual financial statements of 134 associations for the 1932-33 season, 166 for the 1933-34 season, 174 for the 1934-35 season, and 233 for the 1935-36 season. Data were also gathered as to size of plants, types of power, and operating methods and practices. Analysis is made of expenses, the factors affecting expenses, and the sources and amounts of net operating income and its disposition. The possibility for pooling in associations is also discussed.

The average expense per bale varied from below \$3 in 68 of the reports to over \$15 in 41 of the reports. They averaged \$17.42 for 5-80 plants ginning less than 500 bales, \$8.09 for those ginning from 500 to 999 bales, \$5.83 for those ginning from 1,000 to 1,499 bales, \$3.35 for those ginning from 3,000 to 3,499 bales, and \$2.36 for those ginning from 6,000 to 6,499 bales. Volume ginned affected unit expenses for taxes, insurance, depreciation, and management more than other expenses. Size and efficiency of plants affected costs, but type of power used had no substantial or constant effect. During the 3 yr., 1933-35, about 56 percent of the net income was from sale of bale cotton (less than one-half of the cotton gins bought and sold by associations), ginning and wrapping 15.7 percent, cottonseed sales 22.4 percent, and side line sales (coal, feed, seed, etc.) 6 percent. The net income per bale cotton bought and sold varied from profits of \$4 or more to losses of over \$3 per bale, net ginning incomes from profits of \$3.50 and over to losses of over \$5 (about 40 percent of the associations showed profits). All gins had net incomes from the sale of bagging and ties. The income varied from less than 15 ct. to over 60 ct. per pattern. All but five associations made a profit from the sale of cottonseed, varying from less than \$2 per ton to over \$5 per ton. Half of the gins handled side lines and the net incomes varied from losses of 5 percent to a profit of 4.9 percent. For the 3 yr. the average dividend per association on invested capital was \$422, the patronage dividends \$2,583, losses from bad debts \$247, and Federal income taxes and dues from members \$77.

Cooperative grain marketing in the United States, H. HEDGES (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-122 (1941), pp. [2]+12, figs. 8*).—This circular is based chiefly on a general survey of farmers' cooperatives made in 1937. It describes the growth, financial status, volume of business, side line business, membership, patronage, control, etc., of farmers' cooperative associations and gives some information as to regional grain marketing associations.

The number of associations in the United States increased from 1,656 in 1913 to 2,614 in 1936-37 (2,462 in 1939-40). It is estimated that such associations operate 25 percent of the country's elevators and warehouses and handle from 35 to 40 percent of the grain. There were 362,840 members and 799,818 patrons, of which 299,709 were members. Sales amounted to \$470,149,000, of which 81 percent was for products marketed and 19 percent for farm supplies purchased. The net gain on the business amounted to \$5,549,000. In 1940 there were 19 regional cooperatives with total assets amounting to \$8,492,000 and a net worth of \$3,474,000.

Cooperative oil associations in Nebraska, L. F. GAREY and J. MASON (*Nebraska Sta. Bul. 333 (1941), pp. 34, figs. 7*).—This study, made in cooperation with the extension service of the State and the Bank for Cooperatives of Omaha, is based on personal visits to the associations in 1936, 1937, and 1938. The associations are divided into those operating service stations and those operating bulk plants. The distribution of the petroleum business in the State, the growth of cooperatives, their financial organization, volume of business,

prices received, shrinkage, expenses, credit and sales policies, methods of paying tank truck drivers, the advantages and disadvantages of purchasing from private and cooperative wholesalers, transportation of oil, and owning and renting stations are described and discussed.

During the period 1935-38 independent companies did about 48 percent, cooperative associations about 14 percent, and major companies 38 percent of the petroleum business of the State. Assets of cooperative service stations average \$20,450, being approximately twice that for bulk stations. Service stations handled an average of 360,245 petroleum units per year, 89.2 percent of which were light fuels. Bulk plants handled 264,822 units, of which 87.7 percent were light fuels. Average unit costs of operation in 1937-38 for service stations were 2.66 ct. per unit for plants handling less than 200,000 units, 2.2 ct. for those handling 300,000 to 399,000 units, and 2.69 ct. for those handling 600,000 units or over. For bulk plants, the average was 2.5 ct. Labor costs constituted from 53.4 percent to 63.8 percent of the total costs for service stations, and 70.5 percent to 77.5 percent for bulk stations. The average shrinkage of gasoline (32 stations) was 3.9 percent in 1937, and 2.9 percent in 1938. Expenses per dollar of sales were 16 ct. where less than 10 percent of the sales were on credit, and 20 ct. where 20 percent or over were on credit. Net gain per hundred dollars of sales was a little greater for stations purchasing from cooperative wholesalers. Operating expenses were about the same whether stations were owned or rented, but fixed costs were \$1.30 less a hundred dollars of sales for the cooperatives owning their plants.

Flax production and climate of North Dakota and Minnesota 1919-1937, T. H. HOPPER and M. JOHNSON (*North Dakota Sta. Bul. 298 (1941)*, pp. 71, figs. 12).—This report is based chiefly on reports of the U. S. Department of Agriculture and commercial analyses of oil in seed and iodine number of the oil. Tables and graphs show the United States acreage, production, value, imports, and net supply of flaxseed by years, 1909-39; production and precipitation data for the two States by counties and crop-reporting districts, 1919-37; oil content and iodine numbers of oil, 1930-37; etc. Correlation analyses are given of the relation of production and climatic factors—acre yield, crop year and July precipitation, average maximum and minimum temperatures, number of days with temperatures of 90° F., excess temperatures in July, oil content, and iodine numbers of oil. The causes for the reduction in yields are discussed.

The analyses showed the following indications: An increase in North Dakota yields of 0.862 bu. per acre for each additional inch of rainfall in July, and 0.436 bu. for each additional inch during the crop year; such correlation of July precipitation was not observed in Minnesota but was found when the States were considered together. Yields per acre and the temperature factors showed a negative correlation, but temperature was the more important in North Dakota. No significant relation was found between oil content and the precipitation factors. The correlations between yield and temperature factors were negative, the coefficients being highly significant for 10 of the 12 relations. The correlation of iodine number with yield per acre and the precipitation factors was positive but not significant. It was negative and highly significant with the temperature factors. The coefficient between it and average July mean temperature was -0.604 ± 0.042 . Higher oil content and higher iodine number were associated. July precipitation and crop year precipitation showed a high positive correlation. July temperatures and precipitation showed a negative correlation.

Country banking in Wisconsin during the depression, F. L. GARLOCK. (Coop. Wis. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 777 (1941)*, pp. 112,

figs. 12).—This bulletin is the second (E. S. R., 73, p. 406) on a study in cooperation with the Agricultural Experiment Stations of Arkansas, Wisconsin, and Utah. The data regarding deferments, waivers of deposits, and changes in capital structure cover all banks in Wisconsin, and were compiled with the assistance of the Wisconsin State Banking Department, the Federal Deposit Insurance Corporation, the Board of Governors of the Federal Reserve System, and the Comptroller of the Currency. That regarding deposits in operating banks and banks administered by receivers and other liquidating agencies is compiled from published reports of banking authorities. Information regarding the operation and financial condition of 42 State and 16 Federal banks in towns and smaller cities was obtained from call reports, earning records, and examination records filed with the State banking department and the Federal Reserve banks of Chicago and Minneapolis. A special study was made of 17 of these banks. The sections of the bulletin analyze and discuss the banking developments in the State, 1930–36—numbers of banks suspending payments, changes in volume and status of deposits, and changes in capital structure; the character and performance of country-bank loans—methods of classifying loans, principal types of loans, character of loans held, and the policy with respect to loans; character and performance of banks' securities investments—relation of securities to total loans and securities, character of securities held, depreciation of securities and effects upon banks, and the examination policy with respect to securities; changes in financial condition of country banks—assets and liabilities, earnings, expenses, and losses, and examiners' appraisals of conditions of banks; and measures for strengthening banks.

[**First and second annual reports of the Manager of the Federal Crop Insurance Corporation, 1939 and 1940**], L. K. SMITH (*U. S. Dept. Agr., Fed. Crop Ins. Corp. Rpts., 1939, pp. 29; 1940, pp. 29*).—The 1939 report discusses the operating experience of the Corporation, the taking of the program to the field, an appraisal of participation in the program, the wheat operations, the actuarial basis for wheat crop insurance, etc., and includes a functional chart for the Corporation and the financial report for the year.

The report for 1940 describes the problems of and their solution by the Corporation and the legislation and plan of operation. The financial report for 1940 is included and commented on, and an appraisal of the 1940 operations and the plans for 1941 are made. The research work on insurance of cotton, corn, and citrus fruits is described.

Farm tenancy in Louisiana, R. J. RAMSEY and H. HOFFSOMMER. (Coop. La. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. [1]+27, figs. 25*).—Farm tenure and ownership and the farm laborers of the State, and the types of tenants, rates of tenancy, methods of rent payment, value of tenant farms, kinship of tenants and owners, changes of residence by tenants, etc., are discussed. The conditions in each of the 11 tenancy areas are described.

Eighteen percent of the agricultural workers of the State are owner-operators, 36 percent tenants, including sharecroppers, 25 percent wage laborers, and 21 percent unpaid family laborers. Of the tenants, 25 percent are independent, 40 percent semi-independent, and 35 percent supervised. More than one-half are colored, and slightly less than 50 percent are croppers. Approximately 12 percent of the tenants pay cash rent, but only a small number pay a standing rent. Over 50 percent of the white, and 40 percent of the colored tenants move every two years. Approximately 50 percent of the wage laborers are white and 20 percent female (9 out of 10 colored).

Farm tenancy in Minnesota, G. A. POND. (Coop. U. S. D. A.). (*Minnesota Sta. Bul. 353 (1941), pp. 56, figs. 5*).—Data are presented on the development

of tenancy in the State, ownership of rented land, characteristics of tenants, systems of leasing, leasing terms, length and security of tenure, effects of tenant operations on quality of farming, and problems arising out of the tenancy situation. The chief sources of data were the Federal Census, Agricultural Adjustment Administration county reports, questionnaire schedules returned by and survey schedules regarding tenants and landlords, and farm accounting schedules. Much of the data is analyzed by type-of-farming areas.

The percentages of farms and farm land operated by tenants increased from 17 percent and 25 percent in 1900 to 34 percent and 47 percent in 1935 in the State, as compared with 35 percent and 31 percent and 42 percent and 45 percent, respectively, for the United States. The average size of tenant-operated farms in 1935 was 180 acres, as compared with 128 acres for owner and 222 acres for part-owner operated farms. The average values per acre were \$40, \$47, and \$36, respectively. Of the farms rented in 1936, 21 percent were owned by lending agencies and other corporations, 46.3 percent by farmers, widows of farmers, and local estates, 10.9 percent by local nonfarmers, and 21.3 percent by individuals and estates outside the county. The average age of tenants was 41 yr., and the average time engaged in farming 11 yr. Forty-four percent of the farms were leased on crop-share cash, 30 percent for cash, 14 percent on livestock-share, and 12 percent on crop-share leases. Seventy percent of the leases were in writing. Of the leases, 82 percent were for 1 yr., 4 percent for 2 yr., 9 percent for 3 yr., 1 percent for 4 yr., and 4 percent for 5 yr. Nineteen percent included a renewal clause. The average occupancy of present farms was 4.6 yr., and 40 percent of the tenants had been on the same farm for more than 5 yr. Over 50 percent of the tenants changed farms on their own volition. Nineteen percent of the crop land on owner-operated farms, and 17 percent on tenant-operated farms, were in soil-building crops. Of the landlords, 35 percent reported lower and 25 percent higher yields than at the time they acquired their farms. Of the tenants, 7 percent reported lower and 51 percent higher yields during their periods of occupancy. The farm accounting records indicated higher crop yields, better selection of crops, and more livestock per 100 acres on owner-operated farms, and larger farms, higher dairy production, greater efficiency in the use of feeds and labor, and higher earnings on tenant-operated farms. Home conveniences were fewer in tenant homes. The principal criticisms of the present tenancy systems by tenants were the limits on choice of crops, lack of facilities for livestock production, lack of security of tenure, and lack of equitability in leases. The chief criticisms of landlords concerned the quality of tenants and equitability of leases.

Index numbers of railroad freight rates on perishable agricultural shipments, United States, 1913-38, C. C. MATLOCK (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. IV+64, figs. 4*).—Tables show by years, 1913-38, the indices (July 1913-June 1914=100) of published freight rates on domestic rail shipment of citrus fruits, apples, other deciduous fruits, all fruits, potatoes, other truck crops, and all fruits and vegetables; similar indices (July 1924-June 1930=100) for citrus fruits from the Pacific Coast, Texas, Florida, and the United States as a whole, apples from the Pacific Coast, Virginia, and the United States, other deciduous fruits (U. S.), all fruits (U. S.), potatoes from Maine, Idaho, and United States, other truck crops (U. S.), and all fruits and vegetables (U. S.). Other tables show the fruit and vegetable tonnages originated by rail carriers by years 1899-1921, the tonnages originated on class I railroads 1921-39, freight revenues from fruits and vegetables, class I steam railroads 1928-39, seasonal weights used in the computation of the annual average freight rates for individual origin—destination complete, annual quan-

tity weights used in composing the aggregates on which the indices rest, and the percentage distribution of the index number aggregates by commodity groups (citrus fruits, apples, other deciduous fruits, potatoes, and other truck crops) for the two base periods.

Price flexibility and price movements in the United States and other countries, M. T. BUCHANAN ([*New York*] *Cornell Sta. Mem.* 239 (1941), pp. 25, figs. 17).—This is a study made on funds supplied by the General Motors Corporation of the variations in price flexibility of internationally important products and their relation to international price movements and price alignment between countries during the period 1922–38. Analyses are made of price movements of 56–64 internationally important products for the United States, Canada, the United Kingdom, and France. Other economic series were used for verification and supplementation. Official wholesale-price, cost-of-living, and price indexes of 40 basic commodities for the above four countries and Netherlands, Belgium, Australia, Sweden, Finland, and New Zealand were examined. In the analyses, the period was divided into two periods, 1922–29 and 1930–38, and the products were classified by stage of fabrication, durability, use, industry represented, and importance in world trade. Most of the price comparisons between countries were made by application of the purchasing-power-parity approach. Gold prices were used for comparisons between countries.

Raw materials in the United States, Canada, the United Kingdom, and France during the period studied were, in general, highly flexible as to prices. Semi-finished goods were less flexible and finished goods were relatively inflexible. Durable goods were more inflexible than nondurable goods. Foods were more flexible than other products and consumers' goods more inflexible than producers' goods. Agricultural products were more flexible than forestry products, mining products ranked next in flexibility, and manufactured products were the least flexible. Importance in world trade had little or no effect on price flexibility. Regardless of classification of products, price flexibility decreased more or less in proportion to the amount of labor, taxes, interest, transportation, and other inflexible costs. In general, similar products in different countries had similar price flexibility, and the factors affecting flexibility were similar. Differences in flexibility for different types of products were more important in periods of rapidly declining prices. In periods of declining prices, prices of raw materials and other flexibly-priced products declined much further than those of finished goods. The disparity continued until prices rose. "The wide price disparities set up during period of price declines were probably an important factor in retarding business activity. Since the prices of raw materials declined much farther than did the prices of finished goods, the purchasing power of producers of raw materials declined rapidly." Except for periods of rapid changes in exchange rates, prices of similar flexibility had similar movements in the countries studied. Regardless of flexibility, the purchasing-power parities were in general in fairly close adjustment with the exchange rates. Prior to the depreciation in the 1930's, little or no disparity existed between prices of a given flexibility and prices of similar flexibility in another country, but during the rapid decline in prices during the early 1930's wide disparities between prices of high and of low flexibility occurred in each country. After the depreciations large differences in prices between countries appeared due to differences in reactions to exchange rates. Flexible prices rose much more rapidly than inflexible prices.

Farm price facts for North Dakota, W. L. ETESVOLD (*North Dakota Sta. Bul.* 299 (1941), pp. 24, figs. 16).—Included are tables and charts, with discussion, showing (1) for 1910–40 the relations of North Dakota wheat prices and

United States wholesale prices, North Dakota and United States prices of farm products, and North Dakota wheat and beef cattle prices; (2) for 1920-39 the average monthly prices and marketings and the number of times prices increased, decreased, or remained the same from one month to the next for wheat, flaxseed, potatoes, beef cattle, lambs, hogs, butterfat, and eggs; and (3) the purchasing power cycles, 1883-1940, of cattle, sheep, hogs, and horses and mules.

Precio del tabaco en rama al agricultor en Puerto Rico del 1907 al 1940 [Farm prices of leaf tobacco in Puerto Rico, 1907-40], J. J. SERRALLÉS, JR., and M. VÉLEZ, JR. (*Puerto Rico Univ. Sta. Bul.* 60 (1941), *Span. ed.*, pp. [2]+42, *figs.* 13; *Eng. abs.*, pp. 34-36).—Tables and charts show the farm prices of leaf tobacco by years, the area, production and value of tobacco harvested 1910-40, the purchasing power of tobacco 1931 and 1935-39, etc. The relationship of the prices of tobacco to production, supplies, consumption of cigars, lower-priced cigars, income of industrial workers, and other factors are discussed.

Farm prices of leaf tobacco in Puerto Rico rose from 12.66 ct. per pound in 1907 to 52 ct. in 1920, declined to 11.44 ct. in 1933, and ranged from 11.81 ct. to 17.22 ct. for different years from 1934 to 1940. The correlation coefficient of farm prices of leaf tobacco and export prices of unmanufactured cured tobacco was 0.97. That for farm prices and production for the period 1934-39 was -0.83. The gross income of the farmers from the sale of tobacco increased from an average of \$2,500,000 for the period 1912-15 to more than \$13,000,000 in 1920, dropped to \$4,670,000 in 1921, rose to \$13,741,000 in 1926, dropped to \$704,000 in 1932, and averaged \$4,000,000 for the period 1936-40 with \$600,000 additional for U. S. D. A. Agricultural Adjustment Administration payments. The purchasing power of the farm prices exceeded the 1910-14 average only in the years 1911, 1912, 1920, and 1926. It was lowest in 1938 (51 percent) and was only 76 percent in 1939. United States per capita consumption of large-sized cigars decreased from 80 in 1920 to 42 in 1939. The demand for cigars retailing for over 5 ct. decreased from 62 percent of the total sales in the period 1920-25 to 11 percent for the period 1935-39. These decreases resulted in almost complete disappearance of exported cigars from the Island. The trend in the per capita consumption of cigars was upward almost continually for the last 20 yr.

The national food situation (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1941, pp. 18, *figs.* 2).—Charts show for 1929-41 the retail prices of all foods and nonagricultural income payments and retail prices of meats, cereals, dairy products, and fruits and vegetables. Tables show for the continental United States the 1925-29 (average) and by the years 1938-41 the supply, exports, stocks on hand December 31, consumption total and per capita of different food products, and the catch, consumption, imports, exports, total and per capita consumption, etc., of fish and edible products.

Cottonseed: Official grading and market news (*U. S. Dept. Agr., Misc. Pub.* 441 (1941), *folder*).—Information is given as to how official grading and the market news work, how they may be obtained, and the advantages to farmers in using them, etc.

Crops and Markets, [July-August 1941] (*U. S. Dept. Agr., Crops and Markets*, 18 (1941), *Nos.* 7, pp. 141-168, *fig.* 1; 8, pp. 169-196, *figs.* 2).—Each number includes crop and market reports of the usual types.

RURAL SOCIOLOGY

Rural regions of the United States, A. R. MANGUS (*Washington: Fed. Works Agency, Work Proj. Admin., Div. Res.*, 1940, pp. IX+230, *figs.* 17).—

This report "provides a geographic background for analyses of the problems of relief and unemployment. Definite rural regions are set up within which social and economic conditions are relatively uniform and among which there are significant differences. . . . Two different sizes of areas are delimited, as obviously a greater degree of internal similarity is possible in small than in large regions. On the basis of carefully selected cultural indices, the counties of the United States have been classified into 218 rural-farm subregions. These in turn have been combined into 32 general rural-farm regions. Taking into account the characteristics of the rural-nonfarm population as well as of the rural-farm population, 264 rural subregions have been delineated and combined into 34 general rural regions. With few exceptions the boundaries of the rural and the rural-farm regions are similar.

"The regions have been used as the basis for the selection of typical counties. Three different sizes of representative samples have been selected for both the rural-farm and the total rural population. Such samples may be utilized for social studies which are too detailed for Nation-wide coverage."

Settlement experience and opportunities on cut-over lands of western Washington, C. P. HEISIG. (Coop. U. S. D. A.). (*Washington Sta. Bul. 399 (1941)*, pp. 56, figs. 10).—Settlement of cut-over lands in western Washington received a new impetus during the 1930's because of lack of employment opportunities in urban areas and because of migration to the Pacific Northwest of distressed agricultural populations from other areas, particularly the Great Plains region. Over one-half of the 1,051 families living in the five local areas studied had moved onto their farms since 1929.

One-third of all occupied farms were less than 20 acres in total area. Forty-three percent were from 20 to 45 acres in size. About 75 percent of all farms had less than 10 acres of cleared land in 1939, and about one-third of all farms had less than 2 acres cleared.

Work on the farm accounted for no more than one-third to one-half of the operator's time on a large part of the farms. Almost 20 percent were classed as undeveloped farms, with practically no cleared land or livestock, though this group averaged 30 acres of land in the farms.

More than 60 percent of total farm receipts came from the sale of livestock products, largely milk and eggs. Feed purchases constituted over 50 percent of all farm expenses on most farms. Farm expenses were greater than farm receipts on undeveloped tracts and farms with less than 100 man-days of productive farm work in 1938. Relatively few farms established since 1929 had more than 100 man-days of productive work. In addition to the farm income, most farms contributed substantially to the family living through food and fuel produced on the farm and through provision of a dwelling. The value of these farm privileges averaged more than \$300 for all groups of farms except the undeveloped tracts, which averaged \$124, so that even where expenses exceeded receipts there was a net gain to the family through farm products consumed by the family.

Total cash expenditures for family living averaged about \$475 per family. Small families had more cash to spend per person for family living than did large families. Over \$200 of food for use by the farm family was produced on most farms, but many farms neglected this possibility of improving their diets. Housing was inadequate on many farms, particularly among the recent settlers, one-fourth of whom were living in inexpensive "shack" type houses.

Two-thirds of the land clearing jobs done in 1939 by the "bulldozer" method were accomplished at a cash cost to the farmer of \$30 to \$75 per acre, not including burning of stumps and debris. Because of the variable quality of

soils in western Washington it is highly important that only the land containing the better soils be cleared.

Dairy and poultry production offer the major possibilities for farm income. A minimum full-time family-type dairy farm on cut-over lands should have 12 milking cows, with 30 acres of cleared land for hay and grain production and an additional 30 acres of stump land for seeded pasture. These are minimums for most soil types available—a larger unit would be preferable. Most settlers in western Washington probably would need a minimum of about \$3,750 of additional financing to provide such a farm business. Expected net cash farm income on such a farm would be \$650. Of this amount about \$160 per year would be needed for a depreciation reserve. An absolute maximum of \$150 per year would be available for servicing the loan. "Frank recognition that in some cases a subsidy is involved should not necessarily discourage such an assistance program, because over \$400 per year per family of public relief funds are now being used to assist about one-half of all new settlers. Substitution of farm income for income now received from public relief funds should be in the public interest."

The adjustment of new settlers in the Yakima Valley, Washington, C. F. REUSS and L. H. FISHER. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 397 (1941), pp. 48, figs. 8).—Numerous seasonal jobs of short duration attract persons to the Yakima Valley. A recent study forecasts a sharp contraction in the acreage now planted to apple orchards. The introduction of asparagus and wine grapes is encouraging, but the support accorded by these new crops is problematical. Newcomers have migrated to the Yakima Valley because opportunities there appear to them better than where they came from. Competition with newcomers is making the adjustment of long-time residents difficult. As soon as the new settlers are accorded a status of equality, their prospects for a successful psychological and cultural adjustment becomes materially enhanced.

New settlement in the Mississippi Delta (*U. S. Dept. Agr., Misc. Pub.* 442 (1941), pp. IV+20, figs. 10).—This publication calls attention to the many serious problems, as well as opportunities, that face present and future settlers in the undeveloped cut-over parts of the Mississippi River Delta. The information is largely a digest of recent studies of settlement conditions in the delta of northeastern Louisiana.

Needed local government reorganization in Ozark land use adjustment areas, F. A. CLARENBACH. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul.* 331 (1941), pp. 132, figs. 9).—The main objectives of the study were to determine "the more important reasons for the serious difficulties of local government in a number of Ozark counties" and "feasible methods for the adjustment or reorganization of local government in the interest not only of economy and efficiency in government itself, but also in the interest of promoting more desirable patterns of land use and settlement." It is based chiefly on detailed fiscal and other data for Iron, Madison, Reynolds, and Wayne Counties, located in a typical rough and stony part of the region. Rather extensive acquisitions have been made in the four counties for national forests, flood control reservoir sites, and a wild life refuge. Two of the counties are among the smaller, and two among the larger, counties in the area. "Part I of this study is a statement of the associated land use and governmental problems of the Ozark region and includes a discussion of the effects of Forest Service and other public acquisitions upon the tax bases and revenues of the four counties. Part II is a brief outline of the basic information necessary for an understanding of the organization, services, and finances of Ozark counties. Possible adjustments in county government are discussed in Part III, and estimated costs

under different forms of organization are compared. Data from Iron, Madison, Reynolds, and Wayne Counties are used as a basis for these estimates. In Part IV school district organization and its possible adjustment in the interest of more effective utilization of available revenues are discussed. Part V consists in a statement of the existing methods and procedures in tax administration, the results achieved, and suggestions for improvement. A concluding section seeks to summarize the adjustments needed in Ozark local government and to indicate procedures for achieving them."

A list of 61 articles, Missouri and Federal official publications and selected references, is included.

Laborers on cotton plantations, S. E. GRIGSBY and H. HOFFSOMMER (*Louisiana Sta., Northeast Louisiana Sta. Bien. Rpt. 1939-40*, p. 25).—Increasing mechanization in cotton farming and reductions in cotton acreage are giving rise to speculation concerning the future of farm tenants, share croppers, and laborers. The present study analyzes the laborer's present economic and social condition on the basis of data gathered largely in Concordia Parish from 27 plantation operators and 254 farm laborers during September 1936. Of the 254 laborers interviewed, 244 were Negro. The total average annual cash income for Negro males from all sources and including the earnings of dependents was \$178. Laborers receiving the larger incomes received a greater percentage of their income from nonagricultural sources than those with lower income.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Cornell University abstracts of theses, 1940 (*Ithaca, N. Y.: Cornell Univ. Press, 1941*, pp. 520).—Included are abstracts of the following theses in agricultural economics, agricultural education, and rural sociology accepted by Cornell University in 1940 in partial satisfaction of the requirements for the doctor's degree: Factors Influencing the Success or Failure of a Selected Number of Supervised Farming Programs, by M. J. Peterson (pp. 106-109); A Study of Conservation Education in the Rural Areas of the United States, by M. F. Vessel (pp. 118-121); Membership Relations of Farmers' Milk Marketing Organizations in New York State, by D. L. Gibson (pp. 136-139); The Ecology of Rural Social Agencies in Pennsylvania, by R. W. Kerns (pp. 140-142); Membership Relations of a Cooperative Purchasing Association, by J. E. Losey (pp. 143-146); A Comparative Study of Women Students in Home Economics, Arts and Sciences, and Education with Respect to Certain Social and Personality Characteristics, by S. Thompson (pp. 151-157); Price Flexibility and International Price Movements, by M. T. Buchanan (pp. 379-382); Rural Public Health Administration and Finance in New York State, by F. A. Coffey (pp. 383-386); An Economic Analysis of Farming in the Cedar Creek Soil Conservation Demonstration Project Area, Franklin County, N. C., by R. E. L. Greene (pp. 387-390); An Economic Study of Land Utilization in Otsego County, New York, 1938, by A. Joss (pp. 391-394); Rural Public Welfare Administration and Finance in New York, by E. A. Lutz (pp. 395-398); A Study of Rented Farms in New York with Emphasis on Rental Agreements, by P. L. Poirot (pp. 399-401); and Farm Success Factors in Central Michigan, by K. T. Wright (pp. 402-404).

A list of titles of master's theses accepted is also included.

The national F. F. A. contest as a measure of ability in judging, W. A. BROYLES (*Pennsylvania Sta. Bul. 408 (1941)*, pp. [2]+22, figs. 8).—A study was made of the judging cards of the Future Farmers of America's judging contest for dairy cattle, livestock, and poultry at the American Royal Live Stock Show at Kansas City for the three years, 1937-39. Analysis is made of the agreement with official placements with the 1-letter and 4-letter placements by all con-

testants and the 10 prize winners. The manner in which the contests are conducted, the methods of selecting the contestants, and the meaning of 1-letter and 4-letter placements are described. Tables and graphs show the agreement of contestants and official placements on different qualities scored.

The author sums up the findings as follows: "In all the data presented, 1-letter agreement, 4-letter agreement, the 10 winners, and the coefficients of correlations, there is general high agreement between contestants and officials. The data justify the statement that the national F. F. A. contests as conducted from 1937 to 1939 were largely free from chance and guessing. Judging contests, because they are based on opinion, can never be reduced completely to a scientific basis; however, they can be so well conducted as to measure with reasonable accuracy judging ability of contestants. It is not unusual at Kansas City for half of the contestants to agree with their officials in the placement of the best and poorest specimens out of at least one of the classes in the contest. In the livestock contest over a 3-year period, 32 percent of the boys agreed with the officials in their final placements of specimens; in the dairy contest 14 percent agreed with officials in final placements; while the 10 winners in the livestock contests were almost in complete agreement with their officials in all the classes of livestock judged. The coefficients of correlations are relatively high considering the number of factors correlated. The high consistency of agreement of contestants with officials throughout the study indicates that general satisfaction with results should be accepted by all connected with the contest."

An analysis of contestant judgments in the scoring of dairy products with a study of some factors which may affect them, G. M. TROUT, W. WHITE, P. A. DOWNS, M. J. MACK, and E. L. FOUTS (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 649-658).—A committee report (E. S. R., 85, p. 103), indicating some factors which may affect a contestant's ability to judge dairy products.

Rural electrification, J. P. SCHAEZNER (*New York: Bruce Pub. Co.*, [1940], rev. ed., pp. IX+266, figs. [167]).—This book (E. S. R., 75, p. 264) is designed for the use of high school vocational agricultural classes. The 25 chapters deal with the distribution of electricity, wiring, use for lighting, power for different purposes, refrigeration, equipment for different uses, etc. Each chapter is divided into six sections—questions for class discussion, equipment for experiments and demonstrations, practices and problems, information, and suggested readings.

Financing agriculture, L. J. NORTON (*Danville, Ill.: Interstate*, 1940, [rev. ed.], pp. [12]+385+[2], [figs. 44]).—This is a revision of the textbook (E. S. R., 79, p. 273).

Consumer education in the schools, H. A. TONNE (*New York: Prentice-Hall*, 1941, pp. XIII+365, [fig. 1]).—This book is designed particularly for senior colleges and in-service graduate students in teachers colleges and schools of education and universities. It includes chapters on: The development of the consumer movement; the need for consumer education; consumer spending; the role of the consumer in economic life; the aims and status of consumer education; consumer education in social studies, through home economics and business education, and in other areas of school training; the course of study in consumer education; consumer choice and desire; teaching consumer goods; consumer services (insurance, credit, home purchasing, law, etc.); methodology and the teacher of consumer education; devices for teaching consumer education; and general problems of consumer education.

Food buying and our markets, D. MONROE, H. KYRK, and U. B. STONE (*New York: M. Barrows & Co.*, 1940, rev. and enl. ed., pp. X+430).—This revised and enlarged edition (E. S. R., 79, p. 273) brings the information more up to date and

incorporates results of new studies. Chapter XI, Legal Protection of the Food Buyer, is rewritten due to the passage of the Federal Food, Drug, and Cosmetic Act of June 1938.

FOODS—HUMAN NUTRITION

Hawaiian and Pacific foods, K. BAZORE (*New York: M. Barrows & Co., 1940, pp. 286, [pls. 7, figs. 2]*).—This volume, dealing with the foods and food customs of the Hawaiian, Samoan, Chinese, Japanese, Chosen (Korean), Portuguese, and Filipino groups in Hawaii, describes the various foods, characteristic dishes, and the methods of serving used by these several groups. This information and the recipes given are based on the experience and observations of the author in the islands and upon information supplied by native students and older native residents. Modified menus suitable for "haole" (Caucasian) hospitality are presented.

[**Food studies by the Indiana Station**] (*Indiana Sta. Rpt. 1940, pp. 71-72, 73, 81*)—This progress report (E. S. R., 84, p. 268) summarizes an extension of studies by R. Jordan and O. Milligan on the palatability, cooking losses, and tenderness of frozen pork, and on hydrogenated lard as a culinary fat: by G. Redfield, P. Jackson, and F. C. Gaylord on the measurement of mealiness in potatoes by the penetrometer and the slot extrusion tester; and by Gaylord and Fawcett on cooking tests of potato varieties.

Effect of metal skewers on cooking time and tenderness of beef, S. COVER. (Tex. Expt. Sta.). (*Food Res., 6 (1941), No. 3, pp. 233-238, figs. 2*).—Three cuts of beef—round, arm-bone chuck, and standing rib—each as paired roasts from the right and left sides of the same carcass, were cooked well-done to an internal temperature of 80° C. at the same oven temperature (125°), one roast of each pair being cooked with skewers and the other without. Tests for tenderness were made by the paired-eating method (E. S. R., 76, p. 126).

The skewers decreased the cooking time and cooking losses, but increased the toughness of the three cuts of beef used. This difference in tenderness between paired roasts appeared to increase as the difference in cooking time effected by the skewers increased. These tests with skewers agreed with other tests (without skewers) with high and low oven temperatures, 225° and 125°, respectively, which resulted in the first case in shorter, faster cooking with increase in toughness, and in the second case in longer, slower cooking with increase in tenderness. Scatter diagrams of time-internal temperature observations indicated that cooking slowed down appreciably when an internal temperature of 65° was reached. This change in slope was more pronounced when skewers were not used, or with the lower cooking temperature. These findings lend support to the suggestion made in a previous publication (E. S. R., 77, p. 880) that differences in cooking time influence tenderness in paired cuts more than does oven temperature. It is suggested that the amount of collagen changed to gelatin during the longer, slower cooking, with the time lag at temperatures around 65°, may have been responsible, at least in part, for the increased tenderness.

Nutritional investigations of Bengal fish, K. C. SAHA and B. C. GUHA (*Indian Jour. Med. Res., 27 (1940), No. 4, pp. 873-876*).—Continuing this study (E. S. R., 82, p. 415), 13 additional kinds, designated by Bengal and zoological names, were analyzed for moisture, body fat, protein, ash, calcium, phosphorus, and total and ionizable iron. Information on the ranges in body weight and the season of catch is also given. The majority were lean fish with fat content ranging from 0.9 to 2.2 percent; but values from 5.1 to 12.1 percent were obtained for 5 of the group; protein varied in the several fish from 14.0 to 19.2 percent; calcium from 0.12 to 0.62; phosphorus from 0.08 to 0.58 percent; total iron from 0.36 to 1.32 mg. percent; and available iron from 0.04 to 0.61 mg. percent.

The use of dried milk in certain institution recipes, G. E. VAIL and E. AMES. (Kans. State Col.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 2, pp. 131-135).—Eleven products, including cocoa, baking powder biscuits, plain muffins, cheese souffle, macaroni and cheese, cream of asparagus soup, cream of tomato soup, white sauce, baked custard, butterscotch pudding, and white cake, were made according to institution recipes from (1) fresh skim milk, (2) dry skim milk in quantities to approximate those of fresh skim milk, (3) dry skim milk in double these amounts, and (4) dry whole milk. Each series was prepared three times, and all products were scored soon after their preparation and given a palatability preference rating by a committee of five. Objective tests were used for the cakes only. No one of the milk variations held first or other given rank throughout the series of products, yet all products were acceptable, and the scores of the palatability committee indicated very little difference in the products prepared with the various forms of milk. Cost calculations showed dry skim milk to be the least expensive form used when calculated in terms of volume equivalents. The others ranked in the following ascending order: Fresh skim milk, dry whole milk, and fresh whole milk. The relative cost, of the nutrients (protein, lactose, ash, and calories) from the different kinds of milk was essentially in the same order as above. The study indicates that dry skim milk and dry whole milk are economical and satisfactory means of supplying milk to institutions.

The effect of cocoa upon the digestibility of milk proteins, L. D. LIPMAN and W. S. MUELLER. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 399-408).—In feeding trials with young rats the digestibility of milk proteins, fed at a 15-percent level in a basal ration of whole milk powder (62.9 percent), cane sugar, and salt mixture, averaged 85.3 percent. Digestible nitrogen was determined as total food nitrogen minus fecal nitrogen (corrected for the small amount of metabolic fecal nitrogen as determined in separate feeding tests on a low-protein diet). The digestibilities of the proteins of Dutch- and American-process cocoas and of the latter in the presence of cocoa fat averaged 38.1, 44.5, and 41.1 percent, respectively, as determined in separate feeding tests employing a basal ration with 16.5 percent of cocoa or with 15.2 percent of cocoa plus 7.4 percent of cocoa fat. With rations containing 52.6 percent of whole milk powder and 15.8 percent of Dutch- or American-process cocoa (corresponding to 3.6 percent cocoa on a liquid milk basis), or containing 48.7 percent milk powder and 14.6 percent American-process cocoa plus 7.1 percent cocoa fat, the digestibility of the food protein in the several mixtures was 69, 71, and 71 percent, respectively. These results, subjected to mathematical analysis, showed that the digestibility of the milk protein in these cocoa-milk mixtures was 78.6, 80.1, and 80.3 percent, respectively. These values compared with the 85.3 percent digestibility of the protein in the plain milk represented reductions of 7.8, 6.1, and 5.9 percent, respectively. Since these reductions, as affected by the addition of approximately 3.6 percent of cocoa (on a fluid milk basis) were comparatively small, it is concluded that "the amount of cocoa in average commercial chocolate milk (approximately 1 percent by weight) has no significant adverse effect upon the digestibility of the milk proteins."

Pasteurization prolongs shelf life of dill pickles. (Coop. U. S. D. A.). (*North Carolina Sta. [Bien.] Rpt. 1939-40, p. 41*).—This progress report (E. S. R., 82, p. 16) concerning research on the processing of cucumber pickles notes the development of a suitable pasteurization method which, if applied shortly after curing, permits the pickles to retain their original crispness and characteristic flavor over a period of many months.

Pork storage in freezer lockers, G. H. WELLINGTON, D. L. MACKINTOSH, and G. E. VAIL. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 313-

319).—Comparison of different treatments of pork loin roasts for freezer locker storage showed that double-wrapped roasts lost less weight than those stored in single wrappings. Storage periods ranging up to 217 days caused increases in the peroxide values, and roasts rolled in oat flour had lower peroxide values and browned more on cooking. Sausages showed little difference in palatability, but it was recommended that storage periods for both roasts and sausages should not exceed 150 days.

The use of the contact plate method to determine the microbial contamination on flat surfaces, W. G. WALTER and G. J. HUCKER (*New York State Sta. Tech. Bul.* 260 (1941), pp. 34, figs. 4).—Methods previously devised and currently in use for determining the number and types of organisms on flat surfaces are reviewed briefly. It is pointed out that all of the swabbing technics necessitate the use of much equipment and of technically trained personnel, and are time consuming. To meet the need in both the food and the dairy industry for a simple and rapid method for determining the amount of bacterial contamination remaining on flat-surfaced eating utensils, dairy equipment, etc., after cleaning, the contact plate method was developed. "The contact plate consists of a sterile flattened tin can cover, $3\frac{7}{16}$ in. in diameter, aseptically filled with agar and kept in a sterile Petri dish. A test is made by placing the contact plate on the surface to be examined for 4 sec., returning the contact plate to the Petri dish, and later counting the colonies which have developed during incubation at 32° C. The contact plate method was found to recover more organisms from the tested surface than a wooden swab method or a flexible wire swab method but fewer organisms than a stiff wire swab method. Possible explanations for this fact are discussed. Approximately 50 field tests showed the contact plate method to be a practical, simple, and rapid means of obtaining an indication of the contamination which exists on flat-surfaced utensils and equipment."

Nutrition studies [by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 446 (1941), p. 405).—This is a report of progress made (E. S. R., 84, p. 547) on various phases of the study of calcium and phosphorus metabolism, including the development of a new salt mixture to replace that of Osborne and Mendel; a study of the utilization of calcium from green leaves that contain oxalates; and a study of the effect of citrates on the healing of rachitic bones.

Some observations on Canadian nutrition, E. W. MCHENRY (*Canad. Pub. Health Jour.*, 31 (1940), No. 12, pp. 584-588).—An address.

Annual review of biochemistry, IX, edited by J. M. LUCK and J. H. C. SMITH (*Stanford University, Calif.: Ann. Rev., Inc., 1940, vol. 9, pp. IX+744, figs. [4]*).—Among the 26 reviews comprising this volume, the following deal with topics of special nutritional significance: Biological Oxidations and Reductions, by K. G. Stern (pp. 1-42); Proteolytic Enzymes, by A. K. Balls (pp. 43-64) (U. S. D. A.); Fat Metabolism, by H. J. Channon (pp. 231-252); Carbohydrate Metabolism, by W. H. Chambers and S. B. Barker (pp. 253-276) (Cornell Univ.); The Metabolism of Proteins and Amino Acids, by H. B. Lewis and R. L. Garner (pp. 277-302); Clinical Applications of Biochemistry, by V. C. Myers and E. Muntwyler (pp. 303-326); Hormones, by F. C. Koch (pp. 327-352); Fat-Soluble Vitamins, by H. Dam (pp. 353-382); The Water-Soluble Vitamins, by S. Lepkovsky (pp. 383-422) (Calif. Expt. Sta.); Application of Radioactive Indicators in Biology, by G. Hevesy (pp. 641-662); and Nonproteolytic Enzymes, by H. Theorell (pp. 663-690).

Annual review of physiology, II, edited by J. M. LUCK and V. E. HALL (*Stanford University, Calif.: Amer. Physiol. Soc. & Ann. Rev., Inc., 1940, vol. 2, pp. VII+501, fig. 1*).—Among the 20 reviews comprising this volume, the following deal with topics of special nutritional significance: Developmental Physiol-

ogy, by H. W. Mossman (pp. 1-20) (Univ. Wis.); The Digestive System, by J. P. Quigley (pp. 45-70); Blood—Coagulation, Biophysical Characters, and Formed Elements, by J. H. Ferguson (pp. 71-108); Energy Metabolism, by W. M. Boothby and D. L. Paulson (pp. 169-180); Endocrine Glands, by D. L. Thomson and J. B. Collip (pp. 309-346); Defense Mechanisms in Infectious and Related Diseases, by P. R. Cannon (pp. 387-410); Exercise, by F. A. Hellebrandt (pp. 411-432) (Univ. Wis.); and Physiological Psychology, by D. G. Marquis (pp. 433-461).

Dietetics simplified: The use of foods in health and disease, L. J. BOGERT and M. T. PORTER (*New York: Macmillan Co., 1940, 2. ed., pp. XI+742, figs. [77]*).—The principal changes in this revision (E. S. R., 77, p. 561), necessitated by the important developments of the past 5 yr., have been in the various chapters dealing with the vitamins. The chapters on cost and racial problems in food and on family dietaries have been revised to include 1940 food prices, and entirely new tables on the nutritive values of foods based on the figures of Chatfield and Adams (E. S. R., 83, p. 699) have replaced the earlier tables based on the figures of Atwater and Bryant. New tables on the vitamin content of foods, edited by H. E. Munsell, are included.

Your child's food, M. E. LOWENBERG (*New York and London: McGraw-Hill Book Co., [1939], rev. and enl., pp. XVIII+299, [pls. 14, figs. 2]*).—This book written in response to requests for adequate and satisfactory menus for young children, presents such material, together with suggestions for meal planning, food preparation, and meal service. A number of breakfast and supper menus satisfactory for and adaptable to the child's needs, a year's dinner menus arranged with reference to foods available in the different seasons, and menus for special occasions are given. The suggestions for the day's diet and the menus and recipes are so planned that they may be used by the entire family. They are based on practical experience with feeding many children in the nursery school at Iowa State College and have been tried successfully in homes. The book includes a foreword and a chapter on eating written, respectively, by P. M. Nelson and L. V. Swanson, and chapters on feeding the child during the first 2 yr. and on allergy by K. Bain.

The Oslo meal: Its acceptability among industrial workers, M. D. WRIGHT (*Jour. Roy. Inst. Pub. Health and Hyg., 3 (1940), No. 10, pp. 253-258*).—The choice of a midday meal of the Oslo breakfast type in place of the hot meal previously served was offered a group of 150 persons consisting of factory hands and office, laboratory, and executive staffs of a small industry. The hot lunch had consisted of hot or cold meat with potatoes, vegetables, and one or two slices of bread supplemented at a small additional cost by dessert of suet pudding, fruit, or custard. The Oslo type meal consisted of a mixed vegetable salad with cheese and herring, whole wheat bread and margarine, junket, or fruit. The Oslo meal has proved increasingly popular among the sedentary workers and others doing light work, but a few hot lunches continue to be served to the men doing extremely heavy work.

Tables are given showing the comparative costs for 3 weeks of the two type meals, with detailed costs for the same period of the Oslo meal and the cost of a typical Oslo meal for 60 persons for 1 day.

Breathing capacity and grip strength of preschool children, E. METHENY (*Iowa Univ. Studies Child Welfare, 18 (1940), No. 2, pp. VI+207, figs. 7*).—This monograph (which contains a foreword by G. D. Stoddard) consists of a detailed report of an extensive investigation conducted with apparatus of new design on breathing (vital) capacity and grip strength of 169 children of both sexes from the ages of 2½ to 6½ yr. Over 6,000 tests of each function

were made and their relation to other anthropometric measurements analyzed. Possible health relationships were also studied, particularly with reference to the occurrence of colds. Although no definite conclusions were drawn as to the usefulness of tests of breathing capacity and grip strength in predicting colds, some evidence was obtained of the decrease in both measurements prior to the onset of a cold. "In view of its important practical indications, this question warrants further investigation." References throughout the text are arranged alphabetically by author in a bibliography of 131 titles.

Cereals and rickets.—XIII, Phytic acid, yeast nucleic acid, soybean phosphatides, and inorganic salts as sources of phosphorus for bone calcification, C. H. KRIEGER, R. BUNKFELDT, C. R. THOMPSON, and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 3, pp. 213-220).—In the present study, using the rat as the test animal, the method of procedure was the same as that employed in previous investigations (E. S. R., 85, p. 279). The yeast nucleic acid, a commercial preparation containing 7.50 percent of phosphorus, and the phospholipide phosphorus, a reprecipitated crude soybean lecithin freed from most of the soybean oil carrier by extraction with acetone, were each compared with inorganic phosphorus in the form of a neutral mixture of mono- and dibasic potassium phosphates at phosphorus levels representing $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ of the optimum level (0.257 gm. per 100 gm.). The tests at $\frac{1}{2}$ the optimum level were conducted both with and without vitamin D supplement. Growth response, bone weight, weight and percentage of bone ash, and response to healing of rachitic lesions, as observed in the distal ends of the radii and ulnae, all indicated that the phosphorus of the yeast nucleic acid and soybean phosphatides was as readily available for calcification of bone as was inorganic phosphorus. Further tests comparing in one series the availability of phosphorus from nucleic acid, phospholipide, phytic acid, and inorganic phosphorus showed the phytic acid phosphorus to be poorly available in marked contrast to phosphorus from the other three sources. "By the addition of vitamin D the utilization of the phosphorus of phytic acid was increased in greater measure than that of the other forms of phosphorus, but it was still less efficient for the production of good bone than the other sources."

Wheat as a dietary source of iron, A. H. FREE and F. C. BING (*Jour. Nutr.*, 19 (1940), No. 5, pp. 449-460, fig. 1).—American-grown wheats were analyzed for their content of total and ionogenic iron, the latter being defined as the iron which yields ions in the course of body processes.

The methods, carried out with precautions against iron contamination or loss, are outlined briefly, total iron being determined on the dry ash by the thioglycollic acid colorimetric method of Hanzal (E. S. R., 70, p. 154), using the technic described by Bing et al. (E. S. R., 71, pp. 726, 882), and ionized iron by a modification of the method used by Elvehjem et al. (E. S. R., 71, p. 130). The 11 varieties of wheat were of various origin and included hard red spring, soft red winter, and durum wheats. The total iron varied from 2.90 to 4.87, averaging 3.94 mg. per 100 gm., and the ionogenic iron varied from 2.46 to 4.04, averaging 3.19 mg. per 100 gm. The ionogenic iron appeared to be a relatively constant proportion of the total iron, varying from 73 to 88 percent and averaging 81 percent of the total.

Biological assays of the iron value of two of the wheats were conducted in 4-week feeding tests with young rats made anemic on a milk diet. The wheats were fed in amounts sufficient to furnish 0.25 mg. of iron daily, and control animals received the same amount of iron from ferric chloride. The percentage utilization, calculated by multiplying the value for retained iron, as determined by analysis of the animals, by 100 and dividing by the estimated iron intake

during the experimental period, was 47 percent for the animals receiving the ferric chloride and 48 and 51 percent for those receiving the wheats. In view of these feeding tests, in which about one-half of the iron of ferric chloride or finely ground wheat was retained by the anemic rats, it is considered difficult to interpret the values obtained from the chemical method for the estimation of ionogenic iron.

Blood uric acid and liver uricase of zinc-deficient rats on various diets, L. W. WACHTEL, E. HOVE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 138 (1941), No. 1, pp. 361-368).—These experiments were based on the premise that a high-fat diet would exert a zinc-sparing action, as it is known to exert a vitamin B₁-sparing action, since zinc and vitamin B₁ are required by the rat on a high-carbohydrate diet. Animals on a high-fat (55 percent lard), low-zinc (1.4 γ per rat per day) diet showed signs of zinc deficiency, however, as evidenced by low weight gains and high blood uric acid, indicating thus that the fat had not exerted a zinc-sparing action and that the zinc requirement in vivo was probably not involved in cocarboxylase function in intermediary carbohydrate metabolism.

High plasma uric acid of zinc-deficient rats was associated with disturbed nitrogen metabolism. This was considered as possibly due to failure in absorption of nitrogenous compounds from the intestinal tract, thus producing an accelerated catabolism of body proteins leading to an increase in the level of blood uric acid. In experiments employing high-protein or high-purine diets, the rate of onset and severity of zinc deficiency was not affected and even when zinc was added to the ration the blood uric acid did not return to normal for 5 weeks. These results made it appear, therefore, that the high uric acid was not the result of protein starvation in the zinc-deficient animals, with subsequent break-down and utilization of body tissues, but a deep-seated derangement of the body mechanism for the production of uric acid. "The concentration of uricase in the livers of the zinc-deficient rats was normal. This fact, along with the effect of certain inhibitors on this enzyme, is discussed in terms of the reported presence of zinc in the uricase molecule."

Blood chloride and phosphorus content as affected by adrenalin injection, R. MACVICAR and V. G. HELLER. (Okla. A. and M. Col.). (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 643-646).—Adrenalin chloride in 1:1,000 dilution was injected subcutaneously into rats, rabbits, and chickens in doses of 0.5 or 1.0 mg. per kilogram of body weight. After from 60 to 90 min. blood was drawn by heart puncture, oxalated, pooled, and analyzed for phosphorus content. The data presented indicate that in these animals "adrenalin reduces the inorganic phosphorus in the plasma and, to a lesser degree, in the cells. A statistical study of these data indicates that this is only probable in the case of the rats and chickens but highly significant in the case of the rabbits. The lipid phosphorus fraction is reduced markedly in chickens. There are no significant changes in the chlorides in the whole blood, the plasma, or the cells."

Adaptation of the growing rat to the ingestion of a constant concentration of fluorine in the diet, M. LAWRENZ, H. H. MITCHELL, and W. A. RUTH. (Univ. Ill.). (*Jour. Nutr.*, 19 (1940), No. 6, pp. 531-546, figs. 3).—In this investigation, one of a series (E. S. R., 82, p. 714) relating to the hazard incident to the consumption of sprayed fruit, six trios of rats, each representing litter mates of the same sex and weight, were selected for fluorine balance studies. Three diets, represented by a basal diet supplemented, respectively, with 3, 6, and 12 p. p. m. of fluorine from synthetic cryolite (the spray chemical) and furnishing, respectively, a total of 4, 6.5, and 12.5 p. p. m. of fluorine,

were fed under a system of food equalization to respective members of each trio for 22–32 weeks, with fluorine balance determinations in successive weekly or biweekly periods. The rats were then killed, body length and empty weight were determined, and skeleton, teeth, and soft tissues were analyzed for fluorine.

The data showed that there was no tendency for the rate of gain to decrease with increasing additions of fluorine to the diet, or for growth, as measured by attained body lengths, to be inhibited; and that with increasing time on the fluorine-bearing rations the rats adapted themselves by excreting greater and greater proportions of the ingested fluorine in the feces and urines. Curves presented showed that the rate of adaptation decreased with elapsed time in that the percentage of fluorine excreted increased toward a maximum value but at a constantly diminishing rate. Maximum adaptation varied from 80.5 to 90 percent. Within the range of dietary concentration of fluorine studied, the adaptation of the growing rat was somewhat less efficient the greater the proportion of fluorine in the consumed food. At the lowest and highest levels of fluorine intake the concentration of fluorine in the bones averaged, respectively, 4 and 2.9 times that in the teeth, thus indicating that increasing consumption of fluorine causes greater increases in concentration of this element in the teeth than in the bones.

The comparative assimilation of fluorine by growing rats during continuous and intermittent dosage, M. LAWRENZ, H. H. MITCHELL, and W. A. RUTH. (Univ. Ill. et al.). (*Jour. Nutr.*, 20 (1940), No. 4, pp. 383–390).—A basal ration containing 1.4 p. p. m. of fluorine was fed in equal amounts to pair mates in 12 pairs of litter-mate rats. One rat in each pair received daily for each 3 gm. of food weighed out 1 cc. of an aqueous solution of synthetic cryolite containing 18 p. p. m. of fluorine. The other rat in the pair received on every third day of feeding as much of the cryolite solution as its pair mate was given on that and the 2 preceding days. At the end of 20 weeks the experiment was terminated and the rats sacrificed for measurement and analysis.

No significant differences between continuous and intermittent feeding of fluorine were found with reference to gain in body weight, attained body length, weight of dry fat-free bone, dry weight of teeth, or weight of soft tissue. With regard to the fluorine content of bones, teeth, and soft tissues, the differences between paired rats favored the rats receiving the continuous dosage of fluorine. It is concluded, therefore, that "continuous administration of fluorine as synthetic cryolite to growing animals results in a greater retention of fluorine in the bones, and possibly the teeth, than the intermittent administration of the same quantity of the element. Hence, in practical nutrition, which involves variable and intermittent consumption of foods, the physiological effects of a given dosage of fluorine in spray residues on fruits or vegetables may be expected to be somewhat less than predicted from experiments involving the continuous administration of fluorine."

Factors affecting the maintenance of cobalt polycythemia in the rat, H. D. ANDERSON, E. J. UNDERWOOD, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 130 (1940), No. 2, pp. 373–378, figs. 3).—Hemoglobin determinations were used as an index of the polycythemia developed in male albino rats (200–250 gm.) on a mineralized milk ration in which the daily mineral supplement per rat included 0.7 mg. of iron as the pyrophosphate, 0.07 mg. of copper as the sulfate, 0.03 mg. of manganese as the chloride, and 0.7 mg. of cobalt as the chloride. Fluctuations in the hemoglobin level observed when blood for the tests was obtained by clipping the end of the rat's tail were largely prevented by modifying the technic of blood sampling to prevent unnecessary losses of blood. By the new technic the lateral vein of the tail

was severed by razor blade or sharp scalpel, thus producing a clean cut which would bleed freely but could readily be sealed by slight pressure directly over the cut.

Whole liver powder, liver extract (Wilson), and a P. A. concentrate for oral use (Lilly) as separate supplements to the milk diet were found to aid in producing the cobalt polycythemia and in maintaining it at a higher level. Casein had a very slight supplementary effect, while liver residue (Wilson) did not. The addition of sufficient NaH_2PO_4 to the milk diet to reduce the Ca:P ratio to 0.6 increased the rate of development of the polycythemia, but resulted in toxic effects and depression of growth.

The lipotropic action of methionine, C. H. BEST and J. H. RIDOUT (*Jour. Physiol.*, 97 (1940), No. 4, pp. 489-494).—The effect of methionine administration on the fat content of the liver was determined in 21-day experiments on white rats weighing about 200 gm. and fed a basal diet containing 5 percent meat powder as the basic protein, fat as beef drippings at the high level of 40 percent, and adequate supplements of cod-liver oil concentrate and crystalline vitamin B₁. With this diet methionine was found to exert a definite lipotropic action, although the decrease in liver fat bore no relationship to the amount of methionine ingested. The lipotropic activity of the diet containing 2 percent methionine was no greater than that of the one with 0.5 percent, although reduction to 0.06 percent caused a definite falling off in lipotropic effect. Under the experimental conditions employed, *d*-methionine, *l*-methionine, and the racemic mixture of the two were of similar activity. The lipotropic effect of a diet containing 30 percent casein, added at the expense of a similar weight of sucrose in the basic diet, was demonstrated. Substitution in the basic diet of cystine (0.10 percent) and *dl*-methionine (0.96 percent) in amounts equivalent to 30 percent of casein had an insignificant effect in comparison with the casein diet. Choline, however, in an amount (0.15 percent) equivalent to that of the casein had a lipotropic effect similar to that of the casein. It is concluded that factors other than cystine and methionine are involved in the explanation of the lipotropic effect of dietary protein.

Lecture on "The Mechanism of Enzyme Action," J. H. QUASTEL (*London: Inst. Chem. Gt. Brit. and Ireland*, 1940, pp. 27).—This lecture, delivered before the Institute of Chemistry of Great Britain and Ireland October 4, 1940, deals with the reversibility and specificity of enzyme action, combination of enzyme with substrate, molecular specificity, hydrogen mobility and exchange in enzyme reactions, attachment groupings in the enzyme, the coenzymes, and enzymes and proteins. A list of 59 references is appended.

Vitamin-A content of liver and deposit fats of some Indian fish, P. K. SESHAN (*Indian Jour. Med. Res.*, 27 (1940), No. 3, pp. 711-720, pls. 2).—Liver oils of 16 species of fish, both fresh-water and marine and designated by native and scientific names, were analyzed by spectrophotometric procedure and also by the Carr-Price method for their content of vitamin A. The values ranged from 300 International Units per gram for liver oil of *Hilsha ilisha* to 44,800 I. U. for *Mystus macronus*, as compared with values of 800 I. U. obtained for Norwegian cod-liver oil and 48,000 I. U. for a sample of halibut-liver oil supplied by Parke-Davis and Co. Six species gave from 10 to 20 times the vitamin A content of cod-liver oil. During the spawning season the liver oils were poor in vitamin A, while in the growth season they were fairly rich. Oils prepared by steaming or by cooking the liver in contact with air lost 20-60 percent of the vitamin A potency. Oils from the fats deposited around the liver were found to contain but little vitamin A or carotene.

In a study of the absorption curves of the liver oils, most of the fresh-water fish-liver oils showed an absorption spectrum with the maximum of the vitamin

A band shifted to the long wave-length region at about 3,450 a. u., with an additional inflection or a band at 2,900 a. u. The shark-, cod-, and halibut-liver oils showed an absorption band with a maximum at 3,280 a. u.

Vitamin-A content of some species of Bengal fish by biological, tintometric, and spectroscopic methods, K. P. BASU, B. C. RAI SIRCAR, and J. C. SEN GUPTA (*Indian Jour. Med. Res.*, 27 (1940), No. 3, pp. 721-729, figs. 2).—Four samples of body oil and eight of liver oil, obtained by ether extraction from Bengal fish, were analyzed for vitamin A content. Biological assay and the Carr-Price tintometric procedure were applied to most of the oils, and two of them were also analyzed by the spectroscopic method. The technics and the method of calculation for the latter procedure are noted briefly. The results showed these oils to be lower in vitamin potency than the international standard cod-liver oil, although most of them were richer than imported varieties of cod-liver oil which lose much of their potency in transit and storage. The two richest oils contained 622 and 727 International Units per gram as measured by the spectroscopic method. None of the liver oils of the fresh-water fish showed the absorption band at 345μ - 350μ characteristic of vitamin A₂.

Investigations into vitamin A-free basal diets, III, A. L. BACHARACH (*Biochem. Jour.*, 34 (1940), No. 4, pp. 542-550, figs. 2).—In this continuation of the series noted previously (E. S. R., 70, p. 421), a modification of the author's earlier vitamin A-free basal diet is described which is said to give a more constant and shorter depletion period, higher incidence of xerophthalmia, and greater response to curative doses. The improvement is thought to be due chiefly to (1) an increase from 5 to 10 percent of the constituents carrying the B vitamins and (2) alcohol extraction of the casein, which removes traces of vitamin A without seriously affecting the biological value. In triad-feeding comparisons of the modified diet ad libitum plus 20 μ g. daily of purified β -carotene, the stock diet at the same level as the modified diet voluntarily consumed, and the stock diet ad libitum, growth differences were insignificant. The conclusion of Coward (E. S. R., 68, p. 565) that males are superior to females in vitamin A assays was confirmed. With male rats a 3-week period gave as accurate results as a 5-week period.

In a study of basic variability of normal animals, 105 young males in groups of 3 per litter were maintained until they were 120 days old on the stock diet, with frequent weighings. Statistical analyses of the growth data showed that over half of the animals in such a group may be expected to differ from the mean in final weight by more than 20 gm., one-third will differ by more than 30 gm., and of every 22 animals 1 will differ by 60 gm. from the mean. No correlation was evident between size of litter from which the triad was taken and initial or final weight of the animals or between these weights and the age (in days) of weaning. In animals taken directly from the breeding stock there was a marked correlation between initial and final weights, but in animals which, with their mothers, had been depleted of vitamin A from about the tenth day after birth (and the mothers had also been on a vitamin A-deficient diet for from 2 to 3 weeks before maturity) the differences were insignificant.

Effect of vitamin-A therapy estimated by a rapid optical test, E. J. P. STEELE (*Lancet [London]*, 1940, II, No. 7, pp. 205-206, figs. 2).—A simple visual test for vitamin A deficiency requiring only 3 min. to complete except in very abnormal cases is described, with a diagram of the instrument employed. The test object consists of a small circular hole (the fixation spot) and a rectangular slot or bar cut in a brass slide which can be inserted in different positions across one corner of a square white-lined box, at the opposite corner

of which is a similarly lined tunnel through which the subject looks. The box is provided with two lamps for the light adaptation and a small lamp behind the test object. The tests consist in determining the recovery times under three alternate 30-sec. periods of light and dark adaptation, and the results are reported as the mode of the three readings. The improvement with treatment is calculated by subtracting the mean of the last two tests during treatment from the mean of the last two tests before treatment and regression after treatment in a similar manner.

Data are reported on the use of the instrument in testing a group of 24 women (wives of unemployed men who were receiving free dinners at a welfare center.) The existence of a learning factor necessitated two separate tests at the beginning with some subjects, after which no apparent improvement due to learning occurred. Treatment with vitamin A for 23 days resulted in definite improvement in the tests in the group as a whole, although a few of the subjects did not respond. The average improvement in the subjects receiving 12,000 International Units of vitamin A plus vitamin D was only about half that of those receiving 24,000 I. U. of vitamin A without vitamin D. In a 4-week period subsequent to treatment there was a slight average regression in the tests.

An analysis of the vitamin-B₁ status of the population of Great Britain, T. MORAN and R. G. BOOTH (*Chem. and Indus.*, 59 (1940), No. 30, pp. 533-537).—Four fairly recent dietary surveys in various parts of England and Scotland were used for calculations of the vitamin B₁ content of the diets, and the data, together with relevant data from Drummond et al., are summarized in terms of vitamin B₁ intake per head classified according to the amount spent per head per week on food. From these and other estimates for various age groups, it is suggested that for the population as a whole the desirable intake of vitamin B₁ is at the rate of 700 I. U. per head per day, allowing an average energy requirement of 2,810 calories. Excluding young children and pregnant and lactating women (whose requirements are higher), the figure becomes 420 I. U. According to this figure and the calculated intakes from the dietary surveys, it is concluded that about half the population of Great Britain has an inadequate vitamin B₁ intake, while the other half is not far removed from the marginal level.

The effect of different levels of vitamin B₁ and iron on the retention of iron and the fat content of normal young rats, H. OLDMAN and F. W. SCHLUTZ (*Jour. Nutr.*, 19 (1940), No. 6, pp. 569-578, fig. 1).—Thirty-six groups of 3 littermate rats weaned from mothers fed the regular stock diet were used in this study. These animals, in a series of experiments of different duration, were given the same diets, but varying amounts of iron (0.02, 0.12, 0.3, 1.0, and 1.6 mg. per rat per day) and vitamin B₁ (3 γ , 9 γ , 14 γ , and 39 γ of pure crystalline thiamin hydrochloride per rat per day). One animal of each group was sacrificed for analysis as a control at the beginning of the study, and iron retentions of the other 2 animals were determined at the end of the experiment. Special precautions were taken throughout to prevent iron contamination in the housing of the animals and in the analysis of the diets, supplements, and the animal bodies.

The results showed that the level of vitamin B₁ intake did not influence the retention of iron at the levels studied. The iron retentions of these young rats with normal iron stores increased as the daily intake was increased from 0.02 to 0.32 mg., but above this level no increase was shown. The average iron content of the body increased from 0.028 to 0.044 and 0.050 mg. per gram as intakes increased from 0.02 to 0.12 to 0.32 mg.; at the higher intakes (1.0-1.6

mg.) the average for all animals was 0.049 mg. per gram. Apparently, therefore, the optimum daily iron intake of rats of this age is not more than 0.30 mg. At this optimum intake level the animals showed no variation in the amount of iron stored (per gram of body weight) regardless of whether the experimental period was 7, 14, or 21 days, indicating a fairly constant rate of storage and the adequacy of a 7-day experimental period for studies on iron retention. On isocaloric intakes, animals receiving 39 γ of vitamin B₁ daily gained on an average 1.1 gm. per week more than their litter mates receiving 9 γ . This difference was found to be significant. Analyses of the bodies indicated that 93 percent of the gains could be accounted for by increases in fat and water content.

Aneurin im Liquor [Vitamin B₁ in spinal fluid], M. KASAHARA and F. MORI (*Klin. Wchnschr.*, 19 (1940), No. 25, p. 631).—Vitamin B₁ determinations by the thiochrome method on the spinal fluid of 10 rabbits gave values ranging from 0.0150 to 0.0220 mg. per 100 cc. In another group of 7 rabbits, corresponding values after the intravenous injection of from 5 to 10 mg. of thiamin ranged from 0.0275 to 0.0350 mg. per 100 cc.

Die Synthese von Vitamin B₁ durch die Ratte [The synthesis of vitamin B₁ by the rat], R. ABDERHALDEN (*Pflüger's Arch. Physiol.*, 243 (1940), No. 6, pp. 762-767, figs. 3).—The parenteral administration of the pyrimidine component (2-methyl-4-amino-5-oxymethylpyrimidine) and the thiazole component (4-methyl-5-hydroxyethylthiazole) of thiamin to rats deprived of vitamin B₁ has been shown to delay the onset of B₁ avitaminosis and to have a curative effect on early symptoms. Further evidence on the ability of the rat to combine both of the building stones of thiamin into the complete molecule was obtained through quantitative determinations of the thiamin and thiamin diphosphoric acid content of the liver and muscles of rats. In rats in a state of B₁ avitaminosis on a vitamin B₁-free diet, no thiamin and only small amounts of cocarboxylase could be detected, while in others maintained for from 10 to 13 weeks on the same diet supplemented with both of the above-mentioned components, significant quantities of thiamin and cocarboxylase were found. Others given only one of the components or other pyrimidine derivatives reacted the same as untreated rats.

Leprosy: Vitamin B₁ deficiency and rat leprosy, L. F. BADGER, E. MASUNAGA, and D. WOLF (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 23, pp. 1027-1041, figs. 2).—In the studies reported vitamin B₁-deficient and normal rats were inoculated subcutaneously with rat leprosy and compared for incubation period of leprosy, size of lepromata at the site of inoculation, and gross evidence of generalization of infection. The relation of calcium deficiency to rat leprosy was also studied in a similar manner but with intravenous rather than subcutaneous inoculations.

The incubation period of leprosy in the rats maintained on the vitamin B₁-deficient diet was definitely shorter than in the normal controls, but evidence was obtained that this was due to some interference with the cellular defense mechanism rather than to the vitamin B₁ deficiency. However, the animals maintained on the vitamin B₁-deficient diet were definitely more susceptible to rat leprosy than were normal rats, as shown by the development of gross evidence of generalization of the infection. This increased susceptibility was shown to be due specifically to vitamin B₁ deficiency, as the rats maintained on the same basal diet but supplemented with vitamin B₁ were no more susceptible than the normal controls. Rats on a calcium-deficient diet were approximately as susceptible as those on the vitamin B₁-deficient diet. This was thought to be due to the inability of the animals on the calcium-deficient diet to utilize

the vitamin B₁ available in the diet. Animals given pure vitamin B₁ as a supplement to the calcium-deficient diet were no more susceptible than normal animals.

The thiamin (vitamin B₁) values of wheat germ muffins, M. L. FINCKE and R. R. LITTLE. (Oreg. State Col.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 6, pp. 531-534, fig. 1).—Wheat-germ muffins made by a formula employing 50 gm. of wheat germ per 200 gm. of white flour and made with or without baking powder (12 gm. per 200 gm. of flour) were assayed both as the raw batters and as the baked muffins for thiamin content. The wheat germ alone was also assayed. Thiamin determinations were made by the curative method of Kline et al. (E. S. R., 80, p. 562) and now designated as the official U. S. P. XI method, the results being compared with those obtained by the administration of thiamin hydrochloride at levels of 6, 7, and 8 μ g.

Wheat germ was fed at levels of 0.3, 0.4, and 0.5 gm., and the muffins, both baked and unbaked, were air-dried and fed in doses of 2.6 or 2.7 gm., these amounts being estimated as containing 0.4 gm. of wheat germ. The wheat germ was found to contain about 19.7 μ g., or 6.5 International Units, of thiamin per gram. No losses in thiamin values were observed due to cooking, since equivalent amounts of the uncooked muffins, whether made with or without baking powder, contained the same amount of thiamin as the corresponding baked muffins. However, there was a loss of 26 percent in the thiamin content of the muffins when baking powder was used.

The effect of long cooking upon the stability of thiamin (vitamin B₁) in cereals, F. HANNING. (Mich. State Col.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 6, pp. 527-530).—Five commercial cereals were assayed uncooked and after long cooking for their content of vitamin B₁. Cooking involved the addition of a weighed portion of the cereal to 10 times its weight of boiling water, boiling for 5 min. over a direct flame, and then cooking for 1 hr. over boiling water in a double boiler. The vitamin tests were carried out by the method of Chase and Sherman (E. S. R., 66, p. 410). The international standard adsorbate was fed at 5-, 10-, 15-, and 20-mg. levels to control groups carried in parallel with the test animals, and the average weekly gain in weight of the test animals was read against a curve of response of the control series to determine the number of International Units in the cereal supplement.

The values found for the uncooked cereals were rolled oats 59 I. U. per ounce, dark wheat cereal 59, two highly milled light wheat cereals 9.4 and 11.1, and a supplemented cereal mixture 47; corresponding values for the cooked cereals (dry-weight basis) were 55, 57, 7.4 and 11.6, and 43 I. U. per ounce. The small loss of vitamin B₁ due to long cooking was statistically significant only in the case of the supplemented cereal mixture.

Michigan-grown red winter wheat was cooked in four ways. Statistical analysis of the data verified the conclusion that pressure cooking of soaked whole grain wheat destroyed significantly more vitamin B₁ than did cooking the soaked whole wheat in a double boiler or cooking cracked wheat without soaking either in a double boiler or in a pressure cooker. With the two exceptions noted, the long cooking of cereals as employed in this study caused no appreciable, i. e., statistically significant, loss of vitamin B₁.

Studies in thiamin excretion, V. A. NAJJAR and L. E. HOLT, JR. (*Bul. Johns Hopkins Hosp.*, 67 (1940), No. 2, pp. 107-124, figs. 5).—Observations are reported on the daily urinary excretion of thiamin (as determined by the Hennessy and Cerecedo (E. S. R., 82, p. 588) modification of the Jansen thiochrome method) by healthy and sick individuals of different ages and on the excretion for 4 hr. following the intravenous administration of a test dose of 1 mg. of thiamin.

Preliminary observations on the rate of disappearance of thiamin from blood serum following an intravenous test dose are also given.

Among the healthy subjects the output of thiamin varied widely, ranging from 60 to 342 $\mu\text{g.}$ daily for 23 normal adults and from 94 to 208 $\mu\text{g.}$ for 10 children. There was also a wide range, from 7 to 440 $\mu\text{g.}$, among 18 subjects of all ages with miscellaneous diseases. Two subjects after 23 days on a very low thiamin diet gave values ranging from 0 to 15 $\mu\text{g.}$ and 0 to 3 $\mu\text{g.}$ respectively, and a third on a strictly thiamin-free diet negative values after 10 days. Negative values were also obtained for 2 patients with clinical evidence of vitamin B deficiency. In normal adults the curve of urinary thiamin excretion following the test dose showed a sharp peak at the end of the first half hour, followed by an almost equally sharp drop in the second half hour, and a leveling off to original values by the end of the fourth hour. In subjects with known thiamin deficiency and in 6 of 10 diabetic subjects the curves were distinguished from the normal by lower peaks at the same time and a more rapid return to original levels. In a few subjects with multiple vitamin deficiencies and 4 of the diabetic subjects abnormal and irregular results were obtained. In normal children single 4-hr. excretion values were higher than for adults on the same dosage. Four diabetic children and 2 with pellagra gave high and 1 of 2 patients with acrodynia low excretion values.

From these observations it is concluded that the test-dose urinary-excretion method is a more reliable measure of thiamin deficiency than the 24-hr. output provided renal function is normal, but that this factor must be taken into consideration, as thiamin is not readily excreted by damaged kidneys.

Preliminary blood studies showed values ranging from 1 to 3 $\mu\text{g.}$ per 100 cc. for normal adults, a sharp rise within 5 min. following the injection of 50 mg. of thiamin, a somewhat less rapid decrease during the following 15 min., and then a slower decrease during the rest of the hour.

Riboflavin content of pork muscle, N. R. ITTNER and E. H. HUGHES. (Univ. Calif. coop. U. S. D. A.). (*Food Res.*, 6 (1941), No. 3, pp. 239-244, figs. 3).—Experiments in which pigs were fed riboflavin at varying levels led to the conclusion that the riboflavin requirement of the growing pig lies between 1 and 3 mg. per 100 lb. of pig daily. Muscles from these pigs, as well as muscles from a pig of the same size and age fed a normal herd ration, were placed in refrigeration at the end of the experiment and were subsequently assayed for riboflavin. The assay method described is credited to Jukes as an unpublished modification of a previous method (E. S. R., 78, p. 386), and involved the growth response of 2-week-old chicks that had been maintained for the first week of life on a normal diet and for the second week on a basal or depletion diet. Fresh pig muscle, found to contain from 74 to 76 percent of dry matter, was adjusted to pH 5, air-dried, and powdered, and was used in that form in the test diets where it was substituted in the basal ration at 5-, 10-, 15-, and 20-percent levels. Growth response of the test groups was compared with that of chicks on the basal diet alone and as supplemented with riboflavin at levels of 100 and 200 $\mu\text{g.}$ per 100 gm. of diet.

Interpretation of the growth curves of the test animals showed that muscles from pigs fed low-flavin diets (1 mg. or less of riboflavin per 100 lb. of pig daily) contained from 5 to 6.6 $\mu\text{g.}$ of riboflavin per gram of dry muscle (from 1.3 to 1.7 $\mu\text{g.}$ per gram fresh basis), while those from pigs fed higher levels (3 and 6 mg.) ranged between 8 and 13 $\mu\text{g.}$ per gram of dry muscle (from 2.1 to 3.3 $\mu\text{g.}$ per gram fresh basis). These results indicated that on low levels of flavin intake the concentration of riboflavin in the pig muscle corresponded to that fed in the diet, but that on higher levels of intake increased consumption did not affect

the riboflavin concentration of the muscle. It is suggested further that the pig apparently has not the ability to synthesize sufficient quantities of riboflavin for normal growth and well-being.

Physiological activity and clinical use of nicotinic acid (and nicotinamide) (*Rahway, N. J.: Merck & Co., 1940, pp. [3]+26*).—This review of the literature on nicotinic acid includes chemical description, history, occurrence, physiological activity, clinical uses, dose and methods of administration, toxicity and pharmacological activity, and methods of chemical assay. References in the text are assembled as a bibliography of 75 titles.

Urinary excretion of nicotinic acid and its derivatives by normal individuals, D. MELNICK, W. D. ROBINSON, and H. FIELD, JR. (*Jour. Biol. Chem., 136 (1940), No. 1, pp. 145-156, figs. 3*).—The procedures developed in the study noted on page 11 were used in the analyses of urine of normal individuals before and after test doses of nicotinic acid or nicotinamide. In the first series of tests 11 normal subjects on self-selected diets with unrestricted but constant smoking and coffee consumption were studied for a period of 3 days with successive 24-hr. urine collections and analyses. At the end of the first day and completion of the largest meal of the day, a single 500-mg. dose of nicotinic acid in water solution was taken. Each of the three 24-hr. urine samples was subjected to the three types of hydrolysis as noted on page 11. The first 24-hr. sample gave no greater values on the second type of hydrolysis than on the first, showing that normally nicotinic acid is not excreted. The values obtained from the first hydrolyzate varied from 1.7 to 29.3 mg. The higher values were from smokers who excreted nicotine chiefly as the unchanged alkaloid. Alkaline hydrolysis yielded trigonelline amounting to approximately 60 mg. per 24 hr.

The administration of the test dose was followed by rapid and marked increase in the urinary nicotinic acid values, as shown by tests at frequent intervals of two of the subjects. The maximal excretion occurred during the first hour, and the excretion was almost complete in 4 hr. On the average 22 percent of the test dose of nicotinic acid was excreted, and of this 51 percent was in the form of trigonelline, 36 percent as nicotinic acid, and 13 percent as free nicotinic acid or amide. When the nicotinic acid was taken fasting, there was an increase of from 100 to 300 percent in excretion over that following the dose taken after eating. The percentage excretion varied directly with the size of the dose. With nicotinamide as the test dose the extra urinary values were much lower, and there was little difference in the results whether the dose was taken before or after meals. The rate of excretion was more gradual and the percentage much larger.

Factors affecting the concentration and distribution of nicotinic acid in blood, D. MELNICK, W. D. ROBINSON, and H. FIELD, JR. (*Jour. Biol. Chem., 136 (1940), No. 1, pp. 157-166, figs. 2*).—As tested by the method described previously (*E. S. R., 85, p. 584*), nicotinamide was found to be stable in blood stored at 5°-8° C. for at least 5 days. A recently ingested meal, coffee drinking, and smoking had no effect on blood nicotinic acid levels. Tests for trigonelline were inconclusive. Blood samples from 25 normal adult males and 13 females in the postabsorptive state gave minimum, maximum, and average nicotinic acid values of 0.54, 0.83, and 0.69 mg. percent for the males and 0.52, 0.74, and 0.62 mg. percent for the females. Values for the same sample of blood were reproducible to within ± 3 percent of the average, but figures obtained at different periods of the day for the same individual in some instances varied widely, although within the normal range. Theoretical recoveries of added nicotinamide as nicotinic acid were consistently obtained.

Calculations from whole blood and plasma nicotinic acid values for 9 subjects showed that approximately 90 percent of the nicotinic acid is in the corpuscles.

Blood values following tolerance tests, for which urine values were reported in the preceding paper, showed that when an oral dose is taken by a fasting subject there is a prompt increase in blood values to a maximum, followed by a rapid return to values somewhat above the basal level, but when the dose is taken after eating the increase is slow, the maximum not being reached until at least 2 hr. after maximal urinary excretion. The plasma rather than the whole blood values parallel both the extent of the urinary excretion and the severity of the unpleasant side reactions associated with large doses of nicotinic acid. Contrary to the results reported for urine, blood levels were found to be similar after nicotinic acid and nicotinamide ingestion.

Vitamin L and filtrate factor, W. NAKAHARA, F. INUKAI, and S. UGAMI (*Science*, 91 (1940), No. 2366, p. 431).—A preliminary announcement of the evidence noted below concerning the nonidentity of vitamin L and the filtrate factor.

Studies on dietary requirements for lactation.—XI, Non-identity of vitamin L complex and the so-called filtrate factor or factor W, W. NAKAHARA, F. INUKAI, and S. UGAMI (*Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers*, 38 (1940), No. 987, pp. 24–32, figs. 2).—Evidence is presented in support of the hypothesis that the vitamin L complex (E. S. R., 72, p. 284) is not identical with the filtrate factor or factor W, as implied in a statement by Sure (E. S. R., 84, p. 420). The evidence consists chiefly in the demonstration that the growth rate of very young rats on the authors' vitamin L complex-deficient diet described in an earlier paper of the series (E. S. R., 76, p. 138) did not differ materially from that on a diet adequate in the lactation vitamin and the filtrate factor. Anatomical examination of rats killed after 25 weeks on the deficient diet revealed none of the pathological changes described by Morgan and Simms (E. S. R., 81, p. 743) as occurring in rats showing lactation difficulties on a filtrate factor-deficient diet.

The authors suggest that the so-called filtrate factor deficiency, as considered by Morgan and Simms, represents a deficiency in the filtrate factor superimposed on that of vitamin L and that the factor W concentrate prepared from liver extract, as used by Sure, must be a mixture of the filtrate factor and vitamin L. The source of the filtrate factor in the authors' basal diet is considered to be located in polished rice powder, which forms 75 percent of the basal diet. Evidence of this is presented in the paper noted below.

The occurrence of filtrate factor (factor W or vitamin B_w) in polished rice, W. NAKAHARA, F. INUKAI, and S. UGAMI (*Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers*, 38 (1940), No. 988, pp. 33–39, figs. 7).—The data leading to the conclusion that polished rice powder contains the filtrate factor in amounts adequate for growth are summarized as follows:

If polished rice powder in this diet is replaced with sucrose, known to be a filtrate factor-free source of carbohydrate, the diet becomes inadequate for growth of young rats; the use in the diet of polished rice extracted with 70 percent alcohol renders the diet capable of supporting only subnormal growth of the rats; but if concentrated 70 percent alcohol extract of polished rice is added, such an inadequate diet as this again becomes adequate for normal growth. In all the cases the polished rice used was previously well washed with water and freed from any adherent matter.

Vitamin C-Untersuchungen an Paprika; vorläufige Mitteilung [Vitamin C studies on paprika], T. JACHIMOWICZ (*Biochem. Ztschr.*, 306 (1940), No. 6, pp. 434–436).—Ascorbic acid content, as determined by 2,6-dichlorophenolindophenol titration of a metaphosphoric acid extract of the fruit, is reported for 10 varieties of peppers, 6 of which are designated as vegetable varieties and 4

as varieties utilized in the preparation of the condiment paprika. The fruits were analyzed without seeds or placenta. For the vegetable varieties in which the average weight of the fruits varied from 53 to 215 gm., ascorbic acid values ranged from 112 to 238 mg. per 100 gm. of fresh substance; the condiment varieties, weighing from 3 to 21 gm. per fruit, contained from 209 to 342 mg. per 100 gm. Nine varieties, including both types, were analyzed at three stages of maturity designated as market ripe (green or yellow), intermediate (mixed color), and full ripe (red) to give respective values which ranged from 112 to 342, from 177 to 406, and from 171 to 348 mg. per 100 gm. (fresh basis), thus indicating that maximum concentration of the vitamin was reached at the intermediate stage, declining somewhat as the fruit matured further.

Loss of vitamin C during cooking of rhubarb, E. J. BROWN, H. SCHUELE, and F. FENTON. (Cornell Univ.). (*Food Res.*, 6 (1941), No. 3, pp. 217-224).—Four varieties of rhubarb grown on sandy loam soil in the same plot with the same fertilizer treatment were cut in the early morning and analyzed shortly afterward for their vitamin C content by the method of Mack and Tressler (*E. S. R.*, 78, p. 154). Stalks of Victoria, Ruby, and McDonald varieties contained about 0.06 to 0.07 mg. per gram, and the Linnaeus variety about 0.11 mg. per gram. Stalks of the Victoria variety obtained from the same plants in 1939 and 1940 contained about 0.08 and 0.06 mg. per gram of peeled rhubarb in these two seasons, respectively. On the dry-weight basis, however, the 1939 samples were only slightly higher. During both years with all four varieties, the top 4 in. contained almost three times as much vitamin C as the bottom 4 in. and the top half about twice as much as the bottom half. The skin, containing about 0.08 mg. per gram, was slightly higher in vitamin C than the rest of the stalk, which contained about 0.06 mg. per gram. Rhubarb of the Victoria variety lost no vitamin C upon storage overnight in the hydrator of an electric refrigerator held at 35° F.

The Victoria variety, the only one subjected to cooking tests, retained about 88, 80, and 73 percent of its vitamin C upon baking, either peeled or unpeeled and with or without the addition of sugar, for 30, 35, and 40 min., respectively. Quantities of 400 gm., peeled or unpeeled, cooked with 30 cc. of water for 10 min. in an open enamel or glass stewpan retained from 84 to 87 percent of the vitamin C. Covering the glass stewpan increased the retention to about 92 percent. No appreciable amount of dehydroascorbic acid was formed during cooking or during extraction of the raw samples.

A rapid method for differentiating children with large or small reserves of vitamin C, J. PEMBERTON (*Brit. Med. Jour.*, No. 4154 (1940), pp. 217-219, figs. 2).—In tests conducted on a single adult and a group of 60 boys, the maximum excretion of a suitable test dose of ascorbic acid given by mouth occurred 4 hr. after its ingestion. Based on these findings, the method proposed consists in collecting the fasting morning sample of urine, giving a test dose of 50 mg. per stone (14 lb.) body weight, and collecting a specimen voided 4 hr. later (discarding interim specimens and allowing not more than a cupful of water to be drunk during the 4-hr. period). Under these conditions it is considered that a child which responds to this test dose by yielding a marked increase in the concentration of vitamin C in the urine passed 4 hr. after is receiving an adequate amount of vitamin C in its diet. "If there is no response it may be inferred that the vitamin is being taken up to be stored and/or utilized, and that there is a lack of vitamin C in the tissues."

Vitamin-D content of the liver and body oils of Bengal fish, K. P. BASU and J. C. SEN GUPTA (*Indian Jour. Med. Res.*, 27 (1940), No. 4, pp. 865-871).—The liver oils of seven species and the body oils of four species of fish, extracted by

the same process as used in the study noted on page 129, were assayed in comparison with a standard vitamin D solution (a League of Nations standard irradiated ergosterol preparation). Rats or chickens or both were used as test animals in a method involving determination of bone ash. The relative effectiveness of the different oils was not identical in tests employing both rats and chickens, thus indicating the multiple nature of vitamin D. The vitamin D content of liver oils of the Bengal fish was found to be small as compared with cod-liver oil containing 150–200 rat units per 100 cc. The most potent of the oils, the Ruhee-liver oil, was only about one-third as active as cod-liver oil.

Effect of fluorine on the activity of vitamin D in rachitic rats, K. MORGAREIDGE and S. B. FINN (*Jour. Nutr.*, 20 (1940), No. 1, pp. 75–84, figs. 4).—The effect of orally administered fluorine in altering the bone picture developing in rats on a rachitogenic ration was studied in three experiments in which radiograms of the knee joints of animals of the test group receiving fluorine were compared with those of rachitic and normal controls. Comparisons were made at the end of the rachitogenic period and again after a curative period in which vitamin D was administered, the test animals continuing to receive the fluorine supplements in this period. The normal and rachitic controls showed the usual pictures, as evidenced by the radiograms, but in the fluorine-fed animals both the development of the rickets and the healing produced by vitamin D were affected.

Typical radiograms from the several experiments are presented, showing in general that fluorine present in a rachitogenic diet decreases the apparent severity of the rickets and causes atypical healing by vitamin D. Fluorine inhibits the healing process when given simultaneously with vitamin D to rats not previously subjected to fluorine poisoning.

The effect of ingested vitamin E (tocopherol) on vitamin A storage in the liver of the albino rat, A. L. BACHARACH (*Quart. Jour. Pharm. and Pharmacol.*, 13 (1940), No. 2, pp. 138–149, figs. 2).—In an attempt to confirm the observation of Moore (E. S. R., 85, p. 573), it was found that in vitamin E prophylactic or curative tests with normal doses of tocopherol there are no detectable differences in the vitamin A storage in the livers of the experimental and the control animals, but that with relatively massive doses of tocopherol the liver stores of vitamin A are significantly higher in the animals receiving vitamin E than in the controls. With increasing age both food consumption and storage of vitamin A increase, the latter not only in absolute amounts but in percentages; animals of identical strain, treatment, and dietary habits show large variations in liver reserves of vitamin A; and there are significant differences between the sexes in food consumption, body weight, liver weight, and liver stores of vitamin A.

The influence of liver damage on the plasma prothrombin concentration and the response to vitamin K, S. P. LUCIA and P. M. AGGELER. (Univ. Calif.). (*Amer. Jour. Med. Sci.*, 201 (1941), No. 3, pp. 326–340, figs. 4).—Case reports are presented for a number of patients upon whom oral hippuric acid liver function tests were performed and whose prothrombin concentrations were determined. No significant correlation was found to exist between these two determinations. Patients with evidence of severely impaired liver function were found to have either normal or low prothrombin concentrations and of the latter cases some were completely refractive to vitamin K therapy, while others responded with an elevation of prothrombin to normal. Failure to recover from hypoprothrombinemia following administration of vitamin K could not be correlated with the degree of impaired liver function as shown by the hippuric acid test. The limitations of prothrombin concentration as a liver function test are discussed.

TEXTILES AND CLOTHING

The new synthetic textile fibers, H. R. MAUERSBERGER (*Rayon Textile Mo.*, 21 (1940), Nos. 11, pp. 37-39; 12, pp. 51-53).—This address discusses the various new textile fibers and latest developments. Nylon, Vinyon, casein, and soybean filaments and fibers, corn fibers, fibroin filaments, glass and chitin fibers and filaments, gelatin silks, and filaments from ossein, lichenin, pectin, Iceland moss, agar-agar, and alginic acid are considered.

The effect of light and of heat on the breaking strength, color, and copper number of viscose, cellulose acetate, and cuprammonium rayon fabrics, M. H. HOUSTON and H. FLETCHER. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 309-311, figs. 3).—Essentially noted from another source (E. S. R., 85, p. 862).

Microscopic structure of the cotton fiber, C. W. HOCK, R. C. RAMSAY, and M. HARRIS (*Amer. Dyestuff Rptr.*, 30 (1941), No. 3, pp. 53-60, 75-76, figs. 11).—Essentially noted from another source (E. S. R., 85, p. 282).

Studies on the prevention of shrinkage in woollen goods, M. R. FRENEY and M. LIPSON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 1, pp. 25-39, figs. 2).—Laboratory studies on the action of alcoholic solutions of alkalis on wool are described, with particular reference to the unshrinkability imparted by such treatments. Unshrinkability was assessed by measurement, with a planimeter, of the area of relaxed rectangular strips of fabric before and after washing by a standard procedure. In one series of experiments short immersion periods, which could be applied industrially to a continuous process, were studied, while in a second series, conducted on a semicommercial scale, longer immersion periods were used to determine the best conditions for a steeping process. Time, temperature, strength of potassium hydroxide, and water content of the alcohol were the variables studied. The results, which are tabulated and discussed, indicated that the optimum conditions for the continuous treatment are 6-7 percent KOH and 5 percent water (i. e., 95 percent alcohol) at 25° C. for 90 sec. Temperature was the most critical feature. KOH as low as 4 percent or water varying between 2 and 6 percent still gave satisfactory shrinkage reduction. In the industrial steeping process, using a 30-min. immersion period, 0.75 percent KOH in ethyl alcohol containing 5 percent of water and temperatures from 15° to 25° were found satisfactory, although some damage to the wool was noted at 25°.

"No alteration in weight of wool results from treatment, and the regain of treated wool has been found to be the same as that of normal wool. Unless restored by surface active agents, the handle is impaired by the treatment. Among such softening agents, the cationic soaps give the best results. Washing and wearing tests on several types of socks indicated that the treatment prolonged the useful life of the garments."

A method for assessing shrinkage in woollen fabrics, E. H. MERCER (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 1, pp. 40-46, figs. 5).—Change in extensibility associated with irreversible shrinkage due to felting was measured by a method involving inflation of tubular knitted wool fabrics. To eliminate the complication introduced by "set", the fabric was used as a wet sample relaxed overnight in distilled water. Within the tubular fabric a rubber bladder, connected with a mercury manometer, was inflated at a constant rate. The circumference attained was plotted as a function of $p-p_b$ where p was the inflation pressure read on the manometer when the woollen jacket was on the bladder, and p_b the reading at the same circumference of the bladder alone. The slope of the curve gave a measure of the extensibility of the fabric. For purposes of comparison the circumference at 20 mm. was read from the graph.

This method of determining felting of woollen materials was compared with the more common method of measuring area shrinkage in a series of washing tests. Both methods usually led to the same conclusion, although it was considered that the inflation test suggested more concerning the condition of the fabric. Application of the method (1) in a study of the effect of temperature on the degree of unshrinkability produced by the Freney-Lipson process noted above and (2) in a comparison of this process with the sulfuryl chloride process indicated (a) that a rise in temperature from 15° to 35° C. increased the effectiveness of the treatment and (b) that the two processes similarly reduced the felting rate.

Determination of wearing qualities by air flow measurements, E. J. SAXL (*Amer. Dyestuff Rptr.*, 29 (1940), No. 24, pp. P637-P640, figs. 4).—The method presented for evaluating the progress of wear of a fabric tested in an abrasion tester makes use of the progressive porousness of the fabric. The Saxl abrasion tester described admits of adjustment for speed of motor, load upon the abrading surface, and definite stretch of sample; permits of ready exchange of materials on the abrading arm; and is equipped with a suction device for cleansing the surface of the specimens under test and with an attachment for chemical solutions to moisten the cloth.

In actual operation the cloth is inserted, the motor is switched on, and then, depending upon the disintegration, the sample is removed every 500 or 1,000 double rubs, tested for porosity, and then reinserted. As the fabric gets more flimsy under protracted wear, it offers less resistance to a stream of air passing through it, this increase in porousness being read directly on a separate instrument, the porosity or air flow tester. This instrument sends a current of air that may be controlled by adjusting the speed of the generating turbine through a streamlined system onto the fabric inserted by a simple clamping device. Above the fabric is a slightly conical glass tube within which an air float responds to the lifting force of the air column sent through the fabric. The position of the float indicates by direct reading the amount of air flowing through the tube.

Curves presented to show the influence of the number of abrasion strokes upon tensile strength and upon air flow indicate certain advantages of the latter measurement, including greater precision and indication of break-down to the point where a hole in the fabric begins to appear. With this air flow test all measurements are taken without destruction of the sample on one and the same specimen. This not only increases precision but also the speed of the total test, thus simplifying the method and lowering expenditures.

Variables encountered in Fade-Ometer testing (*Amer. Dyestuff Rptr.*, 30 (1941), No. 3, pp. P64-P66).—Experiments showed that fading proceeded more rapidly when samples were attached to cardboard than when exposed in the metal frames furnished with the Fade-Ometer. The differences were principally in respect to the time required for identical fading, so that comparative results when cardboard (white or gray) was used were considered reliable and useful. There was a slightly slower rate of fading in closed than in open Fade-Ometer frames.

Informative textile labeling, H. F. HERRMANN, L. LITTLE, and J. E. MEILI (*Amer. Dyestuff Rptr.*, 29 (1940), No. 25, pp. P656-P662, figs. 9).—This paper, prepared by a committee from the New York section of the American Association of Textile Chemists and Colorists and presenting the trade's point of view, discusses and gives examples of the progress that has been made in informative labeling as a benefit not only to the ultimate consumer but to all the links in the chain between the manufacturer and the public. It is pointed out that informative labeling should commence at the source of the material, that the

factual information should be based on universal standards and tests developed by an impartial scientific body, such as the A. A. T. C. C., and that these tests should be fair, commercially obtainable, and acceptable as a basis of Federal control. Organizations active in the consumer movement, including organized consumer groups and Government agencies, are listed.

Some scientific aspects of informative labeling, H. F. HERRMANN (*Amer. Dyestuff Rptr.*, 30 (1941), No. 8, pp. 194-196, 217).—This address presents some of the material noted above and lists in addition types of standards and testing methods, established by the A. A. T. C. C. and in use on a voluntary basis by mills and merchandisers, for fastness tests for dyed and printed cotton, wool, rayon, and silk, for determining crease resistance and permanence of finish on fabrics, for determination of fiber mixtures, and for determination of finishing materials. It is pointed out that these tests, most of which apply to fastness properties, are primarily of interest to the manufacturer, but serve to protect the merchandiser or ultimate consumer. With the establishment of testing methods and standards there is need for a glossary of clear definitions and commonly used textile, color, and chemical terms and for the education of advertising copy writers in the use of the terms and in the making of attractive propositions by sticking to the truth. It is considered that the purely scientific analytical data from the standard tests would be more confusing than helpful for the general public, and that it is the interpretation of these data in terms of service facts which should be presented on the label to answer the buyers' questions and build up sales.

Check list of F. T. C. taboos [in textile advertising], N. R. ABELSON (*Textile World*, 90 (1940), No. 12, pp. 50-51).—This is a brief list of textile advertising claims found false or misleading by the Federal Trade Commission under the Wheeler-Lea Amendment (1938) of the Federal Trade Commission Act (1914). The Commission has issued stipulations with regard to the use of the terms, or cease-and-desist orders against their use.

Body measurements of American boys and girls for garment and pattern construction, R. O'BRIEN, M. A. GIRSHICK, and E. P. HUNT (*U. S. Dept. Agr., Misc. Pub. 366* (1941), pp. V+141, pls. 8, figs. 60).—This comprehensive report of a cooperative study noted earlier (*E. S. R.*, 82, p. 430) presents the details of measuring procedures used and of the statistical analysis of data on 147,088 normally active American children between 4 and 17 yr. The 36 measurements were selected with consideration of the practicability of obtaining them and were based on recommendations of manufacturers of children's clothing and patterns, distributors, home economists, and anthropometrists. The measurements taken by 266 persons especially trained for the work were made by methods described in detail and illustrated by photographs and recorded with other pertinent information on printed schedules provided. The schedules, here described, were edited and checks were made for accuracy of measurements and of supplementary information recorded. Approximately 133,000 cases of the 147,088 children actually measured were found suitable for use in the final phase of statistical analysis, which was undertaken to find a classification more satisfactory than that of age for effectively grouping children of similar build.

To determine the type of distribution that might be expected from body measurements, 20 out of 36 measurements, including age, were chosen and a bivariate frequency diagram obtained for each possible pair. As a second step, correlation coefficients were determined for the 190 pairs of the 20 measurements. As a result of these analyses, it was shown that in general variations in linear measurements are best controlled by linear measurements, and variations in girth measurements best controlled by girths, so that combinations of linear

measurements and girths would best control the variations of all the measurements of the set. With the combination of hip girth and stature as a control, a system of sizes for garments and patterns was devised, taking into account the frequency with which different combinations of these measurements occurred among the children studied. The proposed system, setting up 12 groupings corresponding to regular sizes for girls from 4 to 17 yr. of age and 13 groupings for boys of those ages as well as auxiliary sizes for "above-regular" and "below-regular" children, is discussed with respect to application to garment and pattern sizing and to retailing.

Supplementary statistical studies presented deal with matters of scientific interest, such as relationship between body measurements of children at various stages of their development, relation of age to various measurements, body measurements of children living in different parts of the country, and measurements of children of different socioeconomic levels.

Family expenditures for clothing: Five regions. Farm series, D. MONROE, M. Y. PENNELL, E. PHELPS, J. C. HOPPER, and H. HOLLINGSWORTH (*U. S. Dept. Agr., Misc. Pub. 428 (1941), pp. IV+387, figs. 11*).—This report, one of the group presenting details of expenditures for major budget categories (*E. S. R.*, 85, p. 284), shows the ways of spending for clothing by nonrelief, unbroken native-white families of farm operators in 13 farm sections representing the major types of agricultural production in this country. Patterns of clothing expenditures are discussed in detail for one group only, namely, the general farming section of Pennsylvania and Ohio. Similarities and differences between the patterns found in this unit and the others are discussed briefly. Detailed discussion of the use of clothing funds—garments bought and prices paid—by the various groups of family members is presented for the analysis unit comprising four communities surveyed in the North and West. Tables presented in the appendix make it possible to obtain comparable data for other areas. A brief section is devoted to clothing expenditures of farm families other than those in the white operator group.

Farm homemakers dress at low cost yet in good taste, A. BOWIE (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No 6, pp. 6-7*).—A survey of 147 Mississippi farm families to show in detail what clothing the women on the farms had on hand indicated that the clothing supplies were simple and utilitarian, but in good taste and not lacking in originality. A table summarizing the types of garments owned by at least half of the homemakers visited showed that most of them had shoes, silk or rayon hose, and a silk or rayon dress for dress wear in addition to shoes and cotton hose and dresses for home wear.

HOME MANAGEMENT AND EQUIPMENT

A measuring stick for socio-economic status of families, D. DICKINS (*Miss. Farm. Res. [Mississippi Sta.], 4 (1941), No. 6, p. 2*).—A scale based upon equipment and condition of farm living rooms has been developed for measuring the socioeconomic condition of the farm families. Points, positive or negative, assigned to various items of equipment and to general conditions of upkeep, such as cleanliness, orderliness, state of repair, and impression of good taste, sum up to scores indicative not only of tenure status, but also of cash available for family living and of the amount of schooling of the family members. Living rooms of a number of Mississippi farm families scored by this method gave scores of less than 60 for the less privileged farm families and up to more than 100 for the more fortunate families.

Family expenditures for furnishings and equipment: Five regions. Urban, village, farm, D. MONROE, H. HOLLINGSWORTH, M. PERRY, and M. Y. PEN-

NELL (*U. S. Dept. Agr., Misc. Pub. 436 (1941), pp. V+212, figs. 5*).—Ways of spending for furnishings and equipment shown by this report are based on the study of the selected families in the 13 farm sections noted on page 141 and of selected families in 140 villages and 20 small cities. Details of ownership and expenditures for furnishings and equipment by farm families in the sections surveyed in the New England, Middle Atlantic, and North Central region are discussed. Expenditures for these items followed the same pattern in other regions studied, with certain differences in detail due to differences in customs and climatic conditions. The major points of difference between farm and urban groups with respect to ownership and purchase of furnishings and equipment are outlined. Tables presented in appendixes give the detailed information concerning expenditures for furnishings and equipment by the farm counties, the villages, and the small cities in the several analysis units. Tables showing ownership and expenditures by two occupational groups—(1) wage earner and clerical and (2) business and professional—are presented for the villages of the Middle Atlantic and North Central region.

[**Equipment studies by the Indiana Station**] (*Indiana Sta. Rpt. 1940, pp. 72-73, 74, fig. 1*).—Progress is reported in continuation of studies (E. S. R., 84, p. 286) on quick freezing and refrigeration of farm produce, by G. Redfield and T. E. Hinton; and on small electric mixers and beaters for household use, by Redfield.

[**Household equipment research by the Nebraska Station**] (*Nebraska Sta. Rpt. [1940], pp. 56, 61*).—Progress reports are given on the electric energy consumption of household refrigerators in use on farms (coop. U. S. D. A.) and on an extension of studies on gasoline and pressure kerosene stoves (E. S. R., 83, p. 862).

The cleaning action of washers in relation to agitator and tub design, L. J. PEET and G. M. JOHNSON. (Iowa State Col.). (*Jour. Home Econ., 33 (1941), No. 5, pp. 340-343, fig. 1*).—Twelve electric washing machines of the gyrator type but differing in design, including shape, indentations, number and angle of blades, and number of complete oscillations per minute, were tested for their cleaning action on artificially soiled pieces of sheeting constituting part of a standard load. Three series of tests were made. In (1) the agitators were used in their own tubs and operated according to the manufacturers' directions; (2) the agitators were operated under identical conditions of number of oscillations and angle of blades in a control round, single-shell tub with no indentation; and (3) the agitators were operated in the same control tub, but at the angle and speed used in their own tubs. The cleaning action in all cases was determined by reflectometer measurements.

The results in (1) indicated that the angle and speed of rotation had little or no effect on the amount of soil removed when the agitator was operated in its own tub. The two agitators rated highest and lowest in their cleaning ability had approximately the same number of oscillations per minute, and the angles of oscillation were approximately the same. Two agitators with the highest and lowest oscillation rates ranked next to each other in cleaning performance. In (2) there appeared to be no correlation between cleaning action and height and breadth of the agitator blades. With all but two of the agitators the cleaning effectiveness was reduced somewhat under the constant speed and angle of oscillation. The two showing the greatest effectiveness were still further improved by the conditions in (3), suggesting that a change in size and construction of the tub would be desirable. Five of the other agitators gave better results in (3) than in (1), also suggesting the desirability of some improvement in tub design.

"The three tests would seem to indicate that adequate correlation between the size and shape of the tub and the speed and angle of oscillation of the agitator should be made if each agitator is to operate under optimum conditions and give maximum efficiency."

MISCELLANEOUS

Ploughs and politicks, C. R. WOODWARD (*New Brunswick, N. J.: Rutgers Univ. Press, 1941, pp. XXVI+468, [pls. 10], figs. [16]*).—This is a biography of Charles Read of New Jersey (1715-1774) and an annotated presentation (pp. 229-403) of his notes on agriculture.

Timothy Pickering on beef cattle, dairying, and cider, N. M. TILLEY (*Agr. Hist., 15 (1941), No. 2, pp. 98-111*).—A letter of unusual interest, written in 1826.

Employment information, C. R. PECK (*U. S. Dept. Agr., Misc. Pub. 438 (1941), pp. [2]+38, figs. 6*).—This booklet gives general information about securing civil-service employment in the United States Department of Agriculture.

Annual Report [of New Haven Station] for the year ending October 31, 1940, W. L. SLATE ET AL. (*Connecticut [New Haven] Sta. Bul. 446 (1941), pp. 389-445*).³

Research aids farm progress: Fifty-third Annual Report of [Indiana Station], 1940, H. J. REED, W. V. LAMBERT, ET AL. (*Indiana Sta. Rpt. 1940, pp. [2]+112, figs. 26*).³

Biennial Report of the Northeast Louisiana Experiment Station, St. Joseph, Louisiana, 1939-1940, C. B. HADDON, J. A. HENDRIX, ET AL. (*Louisiana Sta., Northeast Louisiana Sta. Bien. Rpt. 1939-40, pp. 30*).³

Mississippi Farm Research, [June-August 1941] (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), Nos. 6, pp. 8, figs. 7; 7, pp. 8, figs. 5; 8, pp. 8, figs. 8*).—In addition to articles noted previously (E. S. R., 85, p. 354) or elsewhere in this issue, No. 6 contains *More Corn, Hay, Less Cotton, State Trend in Acreage*, by M. Guin and D. W. Parvin (p. 6); No. 7, *Sheep Production in Mississippi*, by R. H. Means (pp. 1, 2), and *This Thing Called Parity Price*, by F. Welch and D. W. Parvin (p. 7); and No. 8, *Food and Feed for Mississippi Farms*, by C. Dorman, pp. 1, 2).

Fifty-fourth Annual Report of [Nebraska Station, 1940], W. W. BURR (*Nebraska Sta. Rpt. [1940], pp. 78, figs. 9*).³

Agricultural research in North Carolina: Sixty-second and Sixty-third Annual Reports of [North Carolina Station, 1939-40], R. M. SALTER (*North Carolina Sta. [Bien.] Rpt. 1939-40, pp. 74, figs. 13*).³

Annual Report [of Puerto Rico University Station, 1940], J. A. B. NOLLA ET AL. (*Puerto Rico Univ. Sta. Rpt. 1940, pp. VIII+66, figs. 11*).³

³ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas Station.—Dr. Cecil H. Wadleigh, assistant agronomist, has been appointed senior physiologist in charge of plant physiological investigations in the U. S. D. A. Bankhead-Jones Soil Salinity Laboratory at Riverside, Calif.

Connecticut (New Haven) Station.—Alice L. Dustan, assistant garden editor on the *New York Times*, succeeded Katherine M. Palmer as station editor on October 1, 1941. Henry J. Kiley of the greenhouse force retired on the same date after 46 years of service.

Maine University and Station.—The State Potato Tax Advisory Committee has made available to the station \$45,420 of potato tax funds for 1941-42 for use in research with potato diseases and marketing. Emphasis in the research program supported from these funds is being placed on net necrosis (leaf roll), stem-end browning, bacterial ring rot, purple top, soil fertility in central Maine, and potato byproducts. Dr. Stanislas F. Snieszko, assistant plant pathologist, and Wesley F. Porter, assistant entomologist, have been added to the staff.

Other potato tax funds aggregating \$21,500 have been made available for the construction of a greenhouse on the Aroostook Farm, Presque Isle, where most of the potato disease research is conducted. This greenhouse will be available this winter for potato disease research. It has two ranges, each approximately 100 by 18 ft., and a head house, all designed for work particularly with insects and diseases. The heating plant is equipped with stoker, motorized valves, and automatic heat control devices, and special lights are being installed to provide for growing plants during the winter months. It is expected that the greenhouse will be used throughout the year.

In view of the increased research program, the university has provided the station with new chemical and bacteriological laboratories. The university has also purchased a farm in the town of Chapman, Aroostook County, for the use of the station in its potato breeding program, which is cooperative with the U. S. D. A. Bureau of Plant Industry. The farm consists of 480 acres, mostly wooded, and is well isolated, so that potatoes grown on it can be protected to a large extent from other areas. About 10 acres has been cleared this year and will be available for potato plats next year.

Wisconsin University.—V. E. Kivlin, professor of agricultural education and director of short courses, has been appointed assistant dean of the College of Agriculture.

Office of Experiment Stations.—Dr. Walter H. Evans, associated with the botanical and administrative work of the Office from 1891 until his retirement in 1933, died in Florence, S. C., on November 2, 1941, in his seventy-ninth year. He was a native of Indiana and a graduate of Wabash College in 1837, and received from the same institution the M. A. degree in 1889 and the Ph. D. degree in 1896. A review of his services to the Office appeared in the *Record* at the time of his retirement (*E. S. R.*, 68, p. 573).

R. W. Trullinger, Assistant Chief of the Office, received the honorary degree of doctor of engineering from Rutgers University on October 11, 1941.

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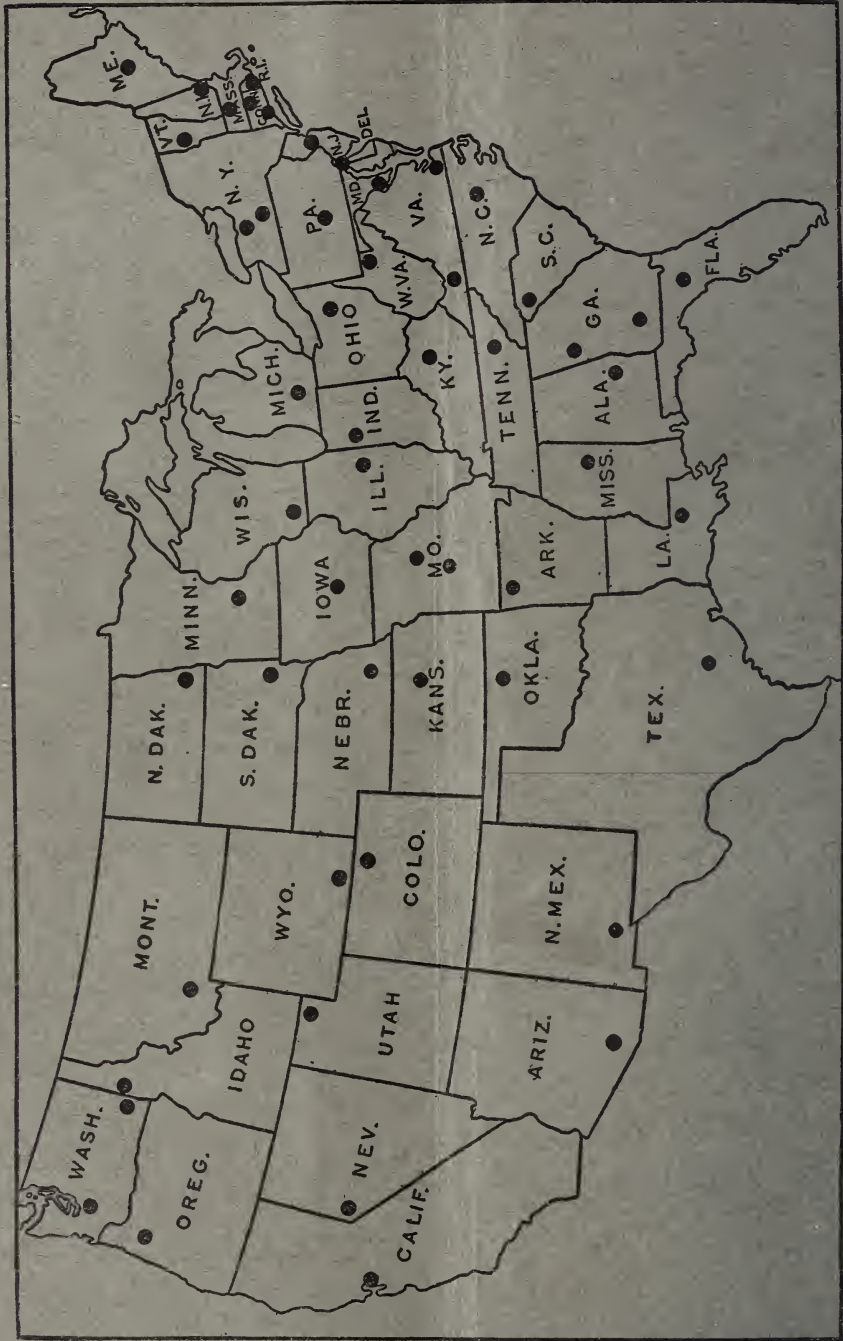
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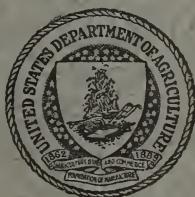
UNITED STATES DEPARTMENT OF AGRICULTURE
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No. 2

EXPERIMENT STATION RECORD



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EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

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No. 2

RESEARCH AT THE 1941 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

National emergency needs and post-war planning, as indicated in the general summary of the convention appearing in the January issue of the *Record*, were the outstanding themes of the sessions held in Chicago last November. Research found itself included in both these phases as an essential factor in the Nation's program of preparedness. The subsection of experiment station work devoted a full session to each of these matters; the section on engineering scheduled a discussion of the status of scientific research in the schools of engineering; and the section on home economics held a luncheon meeting which considered the status of research in home economics in relation to national defense. In addition the presidential address of Dean Mumford and those of numerous other speakers on defense problems and relationships brought out much that was of general interest in this connection.

Probably the topic of greatest immediate applicability was that of research during the national emergency, to which the experiment station subsection devoted its initial convention session. Under the title *Evaluating Existing Projects for Defense Needs*, Director R. B. Corbett of Maryland presented as a basis for discussion a preliminary report of a committee consisting of himself as chairman, Director M. G. Eastman of New Hampshire, and Director S. W. Fletcher of Pennsylvania and dealing with the work of the northeastern experiment stations in relation to defense. This report embodied the results of a questionnaire as to the station work going on in this region and indicated in general that from 50 to 60 percent of the work has a very specific total defense relationship and that the value of from 20 to 30 percent additional has been enhanced rather than reduced by the emergency. In conclusion the committee stated that "it would seem that the greatest responsibility of the administrators in the experiment stations is to show the American public why England and Canada have decided that they will not allow war to destroy their research organizations. One of the lessons learned in the pre-

vious war was that the elimination of research was too costly a procedure to allow it to be repeated. Just as surely as the public becomes acquainted with the work of the agricultural experiment stations, just so surely will they see to it that this work is maintained."

This report was followed by a paper prepared by the staff of the Office of Experiment Stations and presented by Dr. R. W. Trullinger, Assistant Chief, entitled Establishing New Research Projects Under the National Emergency. This paper made it clear that the Federal grant research funds are, as hitherto, limited to research on the subject matter specified in the several acts. "New research to meet emergency needs," it was stated, "should be predicated on the existence of specific agricultural problems, the solution of which is essential to answer questions arising out of the emergency. Research of long or short duration may be required, depending upon the character and scope of the objectives. The time requirement would not appear to be involved. Rather, the pertinent considerations are whether the emergency problem is real and of importance; the objective is clear, sound, and specific; the procedure is well organized and sound; and the facilities, personnel, and financing are adequate."

The paper went on to say that "the agricultural production goals for 1942 as announced by the Secretary of Agriculture probably furnish as good a guide as any to the major lines of research that will need amplification and speeding up. The need for research contributing to the production of more meats, eggs, milk, vegetables, tomatoes, certain fruits, and oil-producing crops, the latter as replacements for import shortages, is indicated. It has been made clear, moreover, that the increased production of agricultural commodities is to be met with present acreages, present herds, and present flocks. This imposes grave responsibilities on research, extension, and action agencies, for it means in substance that livestock feed is to be transformed into more meat and not more animals, poultry feed into more meat and eggs and not more birds, and dairy feed into more milk and not more dairy cows. . . . It seems evident that the availability and effective use of research information on new and old problems will be critical factors in the attainment of the agricultural production goals."

The session of the same subsection on the contribution of agricultural research to the post-war period had as its principal speakers Dr. T. W. Schultz of Iowa, who discussed Public Welfare Problems in Agriculture, and Dean C. E. Ladd of Cornell University, who took up Problems of the Individual Farm Unit. Dr. Schultz suggested as specific lines of attack a determination of the types of capital goods and durable consumer goods which will develop deficits under wartime objectives, increased knowledge of nutrition and diet as an aid

to increased home consumption of foods now being sent abroad, and an increased investment in soil conservation. He also considered the role of research in meeting problems of inflation, maladjustments in relative prices, greater debt and more taxes, a further clogging of the channels of commerce, and an increased governmental participation and administration in economic affairs.

From the standpoint of the individual farm, Dean Ladd called attention to the need of long-time planning and the relative effectiveness of the coordinated outlook program of the Federal Department of Agriculture and the land-grant colleges. "The Nation must first of all," he declared, "adjust its thinking from terms of restricted food production to stimulated production. . . . By 1943, unless we have extraordinarily big crop years, we shall be faced with careful and probably restricted home consumption." Although a post-war depression should be anticipated, he saw reason to believe that it may be delayed for 10 or 12 years after the peace is made. However, "every planning group and technic that we have developed during the years of the depression should be used in an attempt to soften the shocks of the next depression."

Special mention should also be made of the final session of the subsection, which was devoted to a discussion of the U. S. D. A. regional laboratories. The work of each of the Bankhead-Jones laboratories was summarized by Dr. J. T. Jardine, U. S. D. A. Director of Research and Chief of the Office of Experiment Stations, and the progress of the four regional A. A. A. laboratories was set forth by Dr. Henry G. Knight, Chief of the Bureau of Agricultural Chemistry and Engineering. Dr. Jardine stated that the Bankhead-Jones laboratories were authorized in 1935 to provide a joint Department and State experiment station attack on problems of regional or national scope. Conducted in each case with the cooperation and participation of the State agricultural experiment stations in their respective regions, they serve as focal centers for regional coordination and cooperation of research in the subjects which they study, and their work is centered especially upon phases of the problem which would be difficult or impossible for an individual State or a group of States to undertake. Their respective activities now include research into the heredity and behavior of vegetable crop plants for the development of improved varieties having superior adaptation to the southeastern region of the United States; laws and principles underlying pasture improvement in the northeastern region; the industrial utilization of the soybean and soybean products in the north central region; the improvement of swine through the application of breeding methods; the improvement of sheep for western ranges through the application of breeding methods; the mechanism of infection in the con-

tagious, infectious, and parasitic diseases of domestic animals and poultry, and methods of control in the southeastern region; the improvement of viability in poultry; the relationship of the salinity of irrigation waters and of soil conditions to plant growth and related factors involved in a permanently successful irrigated agriculture in the western region; and the relation of soils to plant, animal, and human nutrition.

Dr. Knight announced that the four regional research laboratories authorized in 1938 to search for new and wider industrial outlets for farm products have now "passed from plans on the drawing board to structures of brick and steel. All main buildings have been completed and occupied and partly staffed and equipped. There are now about 180 people employed in the Northern Laboratory; about 155 in the Southern Laboratory; 160 in the Eastern; and 155 in the Western. . . . Equipment has been installed or is being installed in 51 of the 72 individual laboratory units in the Northern Laboratory; in 36 of the 72 units in the Southern Laboratory; in 51 of the 96 units in the Western Laboratory; and in all of the 72 units in the Eastern Laboratory. . . . An increasing amount of research in these four laboratories is centering around defense."

The home economics session on research was addressed by Dr. Louise Stanley, Chief of the Bureau of Home Economics, on the relations of that Bureau to the defense program, and by Miss Sybil L. Smith of the Office of Experiment Stations, who dealt with the research recommendations of the committee on food and nutrition of the National Research Council as a challenge to the land-grant institutions. Miss Smith brought out the fact that of 13 major research projects approved by this committee as of immediate need in the emergency, work was already under way or recently completed on at least 9 by land-grant institutions representing 38 States. These projects she divided into three groups dealing, respectively, with methods of evaluating nutritional status and their applicability to the evaluation of the nutritional status of population groups and to the effects of remedial measures; the metabolism of certain vitamins and minerals and the determination of requirements of these factors by different age groups; and factors influencing the nutritive values of food. She also outlined a proposal for a cooperative research project on the conservation of the nutritive values of foods, on which work is already under way in the Department and in the stations.

Dr. Stanley took as her subject *The Home—Our First Line of Defense*. She dwelt especially on adjustments with which homemakers are confronted, and pointed out that, "faced with the necessity of making such adjustments, homemakers are seeking more than ever the help of scientific facts to help them hold, and where necessary

improve, the American way of living in spite of world crisis." "To meet these demands," she announced, "the Bureau of Home Economics has put aside 'research-as-usual.' Instead, every project, using laboratory technician or economic analyst, has been geared to furnish facts essential to the national defense effort." Among the lines mentioned as particularly concerned were information as to patterns of consumption, research on food consumption and dietary levels, vitamin sources and requirements, the use of dehydrated foods and enriched flours, wider use of cotton in hosiery, standardization of sizes of garments, and substitutes for strategic materials in household equipment.

Further emphasis was given to the need for station research in human nutrition by Dr. C. A. Elvehjem of Wisconsin in his address before the general sessions. In his discussion of Nutrition and Health as Part of National Defense, he pleaded for thinking "in terms of complete nutrition" and cautioned against undue reliance on fortification of staple foods and similar expedients as easier alternatives. "Those of us in agricultural colleges," he said, "should be as interested in the nutritive value of the product produced on the farm as we are in the production of total dry matter. We should make every effort to educate the public on the use of the available natural foods and how proper substitutes may be made when certain of the better known foods become unavailable. If we are to be able to do this, we must be familiar with the fundamental facts about our present-day diet."

Taken as a whole, the research papers were timely and constructive. They revealed the experiment stations as already responsive to existing demands, and alert and ready to make needed adjustments and otherwise render all possible service in the difficult days which lie before us.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Soybean protein: Résumé and bibliography, G. H. BROTHER, A. K. SMITH, and S. J. CIRCLE (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin., 1940, ACE-62, pp. [3]+64, figs. 4*).—About one-third of this publication consists of a highly condensed summary of work on soybeans from their origin and the spread of their cultivation to industrial applications and specific types of industrial products. The remaining two-thirds consists of a classified bibliography grouping the published information under headings the same as those taken up in the prefatory résumé, as follows: Agronomic and general, treatment and processing of whole soybeans, protein extraction from soybean meal, hydrolytic products of soybean protein, enzymes of the soybean, and industrial applications, including adhesives, plastics, paper sizing, and miscellaneous.

[**Isolation of alkaloids from locoweed and from Guajillo leaves**] (*Texas Sta. Rpt. 1940, p. 16*).—A brief note on the products obtained.

The hemicelluloses of sugarcane fiber (bagasse), B. L. DAVIS and M. PHILLIPS. (*U. S. D. A. (Jour. Agr. Res. [U. S.], 63 (1941), No. 4, pp. 241-247*).—Using methods recorded in working detail, the authors removed sugars and pectin from sugarcane fiber or bagasse, partially delignified the residue, extracted and precipitated the hemicellulose fraction, and completed the removal of lignin from this product by chlorination and treatment with dilute alcoholic solution of ethanalamine. They obtained a light-gray product, practically free from nitrogenous substances and lignin, which, on hydrolysis with 2.5 percent sulfuric acid, yielded *D*-glucuronic acid, *l*-arabinose, and *D*-xylose in the approximate molar ratio of 1:0.87:21.9.

Factors which influence the physical properties of dough.—I, Effects of autolysis on the characteristics of dough mixer curves; II, Effects of enzymes on curve characteristics, C. O. SWANSON. (*Kans. Expt. Sta. (Cereal Chem., 17 (1940), No. 6, pp. 679-689, figs. 4; pp. 689-700, figs. 4*).—In the experiments reported upon in the first of the two papers here noted, doughs were mixed until the water was incorporated with the flour, held at 30° C. for various periods, and placed in the bowl of the recording dough mixer. The curves from the autolyzed dough differed markedly from the curves obtained immediately after the water came in contact with the flour. The yield value was such that the pen swung nearly to the top of the chart at once, then oscillated, and there was only a small rise in the curve, decreasing with prolongation of the autolysis. The maximum resistance was brief and was rapidly followed by a minimum. These changes were rapid during the first half hour, slight after 2 hr., and were much more marked in Chiefkan than in Turkey, and more so in Turkey than in Tenmarq.

From the results recorded in the second paper, it was concluded, in part, that the efforts on curve characteristics of incubating flour-and-water doughs are very similar to the effects produced by proteases and the protease activator, cysteine, except as regards the time necessary for effects to become evident. From

this it may be inferred that the influence of autolysis on curves can be attributed to proteases or protease activators.

Factors affecting adsorptive power of magnesia for carotene, G. S. FRAPS, A. R. KEMMERER, and S. M. GREENBERG. (Tex. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 1, pp. 16-18; *abs. in Texas Sta. Cir.* 93 (1941), p. 17).—Additions of water lowered the adsorptive power of activated magnesia to give a product which would not adsorb carotene. Exposing the oxide to carbon dioxide or to air lowered the adsorptive power for carotene of the subsequently activated magnesia, and the addition of small amounts of water to these activated products reduced the adsorptive power for carotene to zero and rendered them suitable for use in purifying carotene solutions. Activated magnesia which adsorbs all the xanthophyll and none of the carotene can now be prepared.

Purity and stability of commercial carotene, G. S. FRAPS and A. R. KEMMERER. (Tex. Expt. Sta.). (*News Ed. (Amer. Chem. Soc.)*, 19 (1941), No. 15, pp. 846-847).—Freshly opened samples of commercial carotene purchased in crystalline and amorphous form in evacuated, sealed tubes were analyzed for colorless impurities by colorimetric analysis, and subjected further to chromatographic analysis. The samples were found to contain from 5 to 15 percent of colorless impurities, from 0.8 to 3.9 percent of colored impurities, from 13.0 to 17.2 percent of α -carotene, and from 80.5 to 86.0 percent of β -carotene. Upon exposure to the air the deterioration of some samples was small, while others deteriorated rapidly, with a loss of as much as 62 percent of the colored material at room temperature and 45 percent at refrigerator temperature in 1 week and with the production of as much as 29 percent of colored impurities in 4 weeks at room temperature. The samples of amorphous carotene contained and developed the greater amounts of colored impurities than did the crystalline carotenes. Purification of the deteriorated carotene was effected by solution in chloroform and precipitation with methanol. This reduced the colorless compounds considerably and the colored impurities to from 1.3 to 5.3 percent in carotene of poor quality; in carotene of good quality the reductions were from 0 to 1 percent and to from 0.3 to 3.3 percent, respectively. Carotene of poor quality after exposure to the air for several weeks was not purified sufficiently by this treatment to be satisfactory for use as a quantitative standard.

Estimation of units of vitamin D and vitamin A in fish liver oils and their concentrates, G. S. FRAPS, A. R. KEMMERER, W. W. MEINKE, and S. M. GREENBERG. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 417-422).—A method for calculating bone-ash results in units of vitamin D in fish oils was devised. Vitamin D was determined by the A. O. A. C. chick method modified by the feeding of the U. S. P. reference oil at 5, 10, and 15 units per 100 gm. of feed, and the oils to be tested were fed at 10 units (as guaranteed) to 100 gm. of feed. When the percentage of bone ash with 10 units of standard oil is too low as compared with the bone ash at 5 or 15 units and the 10-unit level used as a basis of comparison, the units of vitamin D for the oils tested will be too high. More probable results were obtained by using the average bone ash of the 15 and 5 units as the value for 10 units.

Vitamin A was estimated by spectroscopic and by biological methods on 24 samples of fish-liver oils or concentrates, and 18 samples were appreciably below guaranty. The spectroscopic method is deemed satisfactory for rapid preliminary testing of the oils.

Methods of determining vitamin B₁ in foods, E. D. STEWART (*Food Indus.*, 13 (1941), No. 7, pp. 56-61, figs. 4).—This practical review summarizes the various methods now available and points out that problems involved in their use indicate the need for more reliable methods of easier applicability.

A procedure for the routine determination of vitamin B₁ in urine, J. W. FERREBEE and G. A. CARDEN (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 12, pp. 1320-1324, fig. 1).—The technic is described for a modification of the Hennessy and Cerecedo method of determining vitamin B₁ in biological materials (E. S. R., 82, p. 588) to adapt it to the simultaneous determination of a large number of urine samples, using adsorption columns with Folin permittite with the adsorption so regulated that other urinary constituents do not interfere. The vitamin is eluted in the customary manner with potassium chloride, treated with alkaline ferricyanide, the thiochrome shaken out with isobutanol, and its fluorescence measured on a Pfaltz and Bauer photoelectric fluorometer standardized against known thiamin solutions. The conversion of thiamin to thiochrome in both standard solutions and eluates by this procedure is approximately 67 percent of the theoretical maximum for amounts of thiamin between 0.2 and 1.5 μg . Attention is called to the fact that blanks on urines of low vitamin B₁ content are often greater than the thiochrome readings. In the technic proposed determination of the blank is omitted, and an arbitrary blank deduction equal to the reagent blank is substituted.

By the procedure described, recoveries of thiamin added to urine have averaged 92 ± 5 percent. The chief source of error is thought to lie in the eluting process. However, the clinical variations in urinary values which seem to be of diagnostic significance are considerably greater than those inherent in the method, and the results obtained have been more consistent than those obtained by a longer procedure similar to that of Wang and Harris (E. S. R., 83, p. 851). Studies of the stability of thiamin in urine gave results in agreement with those of Melnick and Field (E. S. R., 83, p. 731). The thiamin content of urine was not altered by 12 hours' incubation even at a pH slightly on the alkaline side. The 24-hr. thiamin excretion is thought to furnish a fairly reliable index of vitamin B₁ intake. When the excretion is under 50 μg . per 24 hr., it is considered of importance to distinguish between cases in which the low values are due to temporarily inadequate vitamin B₁ intake and others in which the low excretion represents a real deficiency.

Report on riboflavin, A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 413-423).—This report of the associate referee of the Association of Official Agricultural Chemists concerns the collaborative work on riboflavin determination in yeast and dried skim milk by (1) the colorimetric method noted previously (E. S. R., 85, p. 152), (2) the fluorometric method of Hodson and Norris (E. S. R., 83, p. 151), and (3) the microbiological technic of Snell and Strong (E. S. R., 82, p. 587). The methods are discussed in detail, and the comments and the results of the individual collaborators are presented and discussed. The colorimetric method again gave high results, while either the bacteriological or the fluorometric method was used with a fair degree of accuracy for the two products tested. It is recommended that the two latter methods, as described in this report, be adopted tentatively for the determination of riboflavin in yeast and dried skim milk, and that studies be extended to liver meal, fish meal, alfalfa meal, and other materials. It is also recommended that a primary standard for riboflavin be studied in order to have a method for checking the purity of riboflavin solutions used as standards.

Report on vitamin D: The use of reference cod liver oil and skim milk as the reference substance—a uniform system of scoring, W. C. RUSSELL. (N. J. Expt. Stas.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 403-405).—Replies of 18 collaborators concerning the use of nonvitamin D skim milk with the reference oil according to earlier recommendations (E. S. R., 82, p. 440) indicated that this makes little difference in response if the total quantity of

reference oil used is of the magnitude of 30 mg., but that there is a greater difference in response (with and without the nonvitamin D milk) if the level is at 50 mg. It is suggested, therefore, that if rats require the latter level an attempt be made to produce animals that require a lower level in order that milk samples being assayed will not be penalized because of a relatively large quantity of solids-not-fat that must be fed with the reference oil. A uniform numerical system of expressing degrees of healing for reporting milk assays is considered desirable.

Report on vitamin K: Assay by curative biological test, H. J. ALMQUIST. (Univ. Calif.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 405-413, fig. 1).—The quantitative procedure described in detail involves comparison of the antihemorrhagic potency of any product with that of a C. P. standard antihemorrhagic compound in controlling the blood prothrombin level of chicks. Chicks at hatching are placed on a basal diet composed of ether-extracted sardine meal 17.5, ether-extracted dried brewers' yeast 7.5, ground polished rice 72.5, cod-liver oil 1.0, calcium carbonate 0.5, and common salt 1.0 percent. Extreme depletion in vitamin K, as detected by determination of prothrombin times in a few (5 percent) of the chicks, occurs in from 10 to 14 days, at which time the desired daily dose of the test substance, dissolved in water or in some inert fat solvent such as ethyl laurate, is administered by dropper (from 1 to 4 drops) to individual birds for 4 days. At the same time one group of chicks is kept for negative controls, at least two groups are fed different levels of a reference standard, and a group of four or five chicks of the same lot, and for use in the standardization of the clotting agent, is maintained on a practical chick mash containing at least 5 percent of dried alfalfa. The effect of the supplements is determined on the fifth day, approximately 24 hr. after the last dosage.

Whole blood prothrombin time is determined on oxalated whole blood collected as individual samples from decapitated chicks. A 0.1-cc. portion is pipetted into a small, flat-bottomed vial and treated with 0.2 cc. of mixed thrombokinese-CaCl₂ solution, at which time the stop watch is started, and the vial is placed in a thermostat at 38.5°-39° C. and automatically tilted back and forth until the end point (clot formation) is clocked. The concentration of the thrombokinese, an 0.85 percent NaCl extract of macerated chicken breast muscle, is adjusted so that with an equal volume of 0.025 M CaCl₂ solution it will clot the blood of the normal chicks on the practical mash in from 20 to 30 sec. The unitage of test substance is computed by reference to a curve (line) established from the results with birds receiving the reference standard. This line is established by plotting the reciprocal of the mean prothrombin time against the logarithm of the vitamin K dosage. A number of substances available as pure synthetic preparations, including 2-methyl-1,4-naphthoquinone (or the naphthohydroquinone diacetate), are suggested as reference standards.

The total extraction of free auxin and auxin precursor from plant tissue, G. S. AVERY, JR., J. BERGER, and B. SHALUCHA (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 596-607, figs. 2).—Continuing studies of extraction technics (E. S. R., 83, p. 726), the multisolvent method for auxin gave a yield of approximately 0.7 million TDC/gm. of dormant corn endosperm (TDC=total degrees curvature in the "deseeded" *Avena* test method), equivalent to 7 mg. of indoleacetic acid per kilogram of air-dry corn endosperm. This value apparently represents the approximate amount of free auxin present therein. Extraction of endosperm with successive changes of absolute ethanol alone for a period of 27 weeks yielded a total of only 0.27 million TDC/gm. Extraction with water alone at pH 6-7 gave a yield of about 0.5 million TDC/gm., which could be increased to 6-7 million TDC/gm. by heating an aqueous suspension of tissue at 100° C. and pH 9-10 for

15 min. Thus, approximately 90 percent of the total auxin content of dormant corn endosperm exists as a "precursor," which becomes auxin only after hydrolysis. It has been shown that in vitro conversion of precursor to auxin can be accomplished by nonenzymic procedures. The precursor is readily soluble in water at pH 6-7, but is insoluble in ethyl ether, benzene, petroleum ether, or chloroform. It is soluble to some extent in ethanol, dioxane, and pyridine, and very soluble in methanol. It is easily converted into auxin at alkaline pH values, but with more difficulty at acid pH values. The precursor molecule has a probable molecular weight of less than 13,000. The possibilities of its being an acid amide or an ester are considered. Corn endosperm auxin is very stable to heat and strong alkali, but is completely destroyed by autoclaving in 2.5 N HCl and is thus not identical with auxins a or b. Comparison of the maximum yields of auxin from corn in this study with those obtained by others is believed to indicate that for the first time a reliable estimation of the total auxin content of a tissue can be made with as short an extraction period as 15 min.

A rapid and simple method for determining moisture in forages and grains, R. Q. PARKS. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 325-335, figs. 5).—The determination of moisture in small grains, corn, hay, and silage materials by the simple, inexpensive method described is based on the relationship between original moisture content of the plant tissue and the loss in weight when the sample is mixed with an excess of calcium carbide. The balance, constructed and calibrated to read directly in percentage moisture, operates on the lever principle but has its greatest sensitivity in the range of the last 10 percent of the weight added.

A rapid method for the determination of total phosphorus in soil and plant material, W. R. SHELTON and H. J. HARPER. (Okla. Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 403-413).—Various colorimetric methods for determining phosphorus in different types of organic materials were compared to determine their value for estimating the total phosphorus in the soil. A colorimetric method using hydrazine sulfate as a reagent to form a stable molybdenum blue colloid from phosphomolybdic acid has been proposed for soils which do not contain more than 10 percent of iron. The method proposed can also be applied for determining the total phosphorus in forage and grain by using a mixture of nitric and perchloric acid to destroy the organic matter in these materials.

The determination of small amounts of exchangeable potassium in soils, employing the sodium cobaltinitrite procedure, N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 684-689, fig. 1).—Results obtained from a study of the factors affecting the precipitation of potassium as potassium cobaltinitrite are presented, along with the details of the method finally adopted for the determination of the replaceable potassium of soils.

The spectrographic determination of potassium in leaf material, I. W. WANDER and W. R. BRODE. (Ohio Expt. Sta. and State Univ.). (*Jour. Opt. Soc. Amer.*, 31 (1941), No. 5, pp. 402-404, fig. 1).—A suitable working curve for the determination of potassium in ashed leaves was constructed by using the logarithmic sector method. The potassium line used was that of $\lambda=4,044.16$ a. u. The copper line, used as internal standard, was that of $\lambda=4,022.7$ a. u. Data resulting from the analysis of leaves known to be deficient and leaves known to have received a sufficient amount of potassium revealed the fact that a spectrographic method of analysis is applicable to a quick determination of potassium deficiency. The precision of the method was estimated at from 2 to 5 percent. The spectrographic method was found to be reliable, rapid, and suited to a routine quantitative analysis of leaf material for potassium.

A simple photometric method for determining the protein content of wheat flour, L. ZELENY. (U. S. D. A.). (*Cereal Chem.*, 18 (1941), No. 1, pp. 86-92, figs. 2).—The author proposes a turbidimetric procedure carried out, in part, as follows: A 0.5-gm. sample of the flour is treated with 5 cc. of 95 percent alcohol, 100 cc. of 0.05 N potassium hydroxide is added, the mixture is shaken intermittently for 15 min., and is centrifuged for 10 min. at 1,600 r. p. m., approximately. Of the supernatant liquid 5 cc. is treated with 25 cc. of a pH 7.8 phosphate buffer solution. Light transmission is determined by means of a photoelectric photometer after 1 hr. of standing. A light filter "having a maximum transmission at a wavelength of 530 μ " was used, no characteristics of the filter other than that quoted being specified. It is stated that other wavelengths will give different, but equally satisfactory, results. The results were found to be in good agreement with those of the Kjeldahl method and to be obtained more conveniently and with much less elaborate and less expensive equipment.

The determination of fat in the presence of free fatty acids.—II, Differences in the behavior of individual acids in the Mojonnier test, M. P. STARR and B. L. HERRINGTON. (Cornell Univ. et al.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 807-811).—Continuing this series (E. S. R., 85, p. 158), additional experiments were conducted in which fresh butter oil was weighed into Mojonnier flasks, after which weighed amounts of one of the following fatty acids was added: Butyric, lauric, myristic, palmitic, stearic, or oleic. The fat content of the mixture was then determined by the conventional method. The amount of fatty acid not recovered by this method of testing was as follows: Butyric 100 percent, lauric 93.4, myristic 92.0, palmitic 76.7, stearic 78.2, and oleic 72.5. It was shown that these variations were due, at least in part, to the amount of different acids volatilized when the sample was heated to remove the ether. The possibility of reducing the loss of free fatty acids in this test by the substitution of a stronger base in place of the ammonia used in testing is suggested. Lithium hydroxide appeared to offer promise as a desirable substitute for ammonia.

The effect of fertilization and cultural practices on the oil and ammonia content of cottonseed grown on Yazoo-Mississippi Delta soils, M. GIEGER. (Miss. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 1, pp. 49-54).—On plats of Sarpy loam under various fertilizer and cropping treatments for 10 yr., nitrogenous fertilizers decreased the percentage of oil in the seed but increased the percentage of ammonia; phosphorus and potassium when used separately gave no increase in oil percentage, but when used together gave a slight increase; the percentage of ammonia was unaffected in either case; and green manures, like commercial fertilizers, increased the percentage of ammonia and decreased the percentage of oil on the basis of their nitrogen content. The various methods used in preparing the seedbed, cultivating, and spacing showed little if any influence on the percentage of oil and ammonia in the cottonseed. The quantity of oil and ammonia produced per acre was influenced somewhat by cultural practices, but any advantage of one practice over another is better measured by the quantity of oil and ammonia produced on the basis of acre yield than by the percentage of oil and ammonia in the cottonseed.

Preservation of fruits and vegetables by commercial dehydration, E. M. CHACE, W. A. NOEL, and V. A. PEASE (*U. S. Dept. Agr. Cir.* 619 (1941), pp. 46, figs. 6).—Sufficient concentration of the soluble solids of fruits and vegetables inhibits the growth of molds and bacteria, but enzymes capable of changing the composition, flavor, and appearance are not always inactivated by such dehydration, and fruits and vegetables to be dehydrated must first be blanched or other-

wise processed to inactivate such enzymes. Dehydration has the advantages of reducing bulk and weight, with resultant lowering of storage and carriage costs; a processing cost lower than that of canning or freezing; and products more convenient for use than are the fresh products. The comparative advantages of various types of drying equipment are briefly discussed, and the engineering calculations for dehydrator design are given. Details of preparation, pretreatment, and drying of numerous fruits and vegetables are tabulated. A patent list, list of publications cited, and a supplementary bibliography are added.

This circular supersedes Bulletin 1335 (E. S. R., 54, p. 12).

Resultados practicos del estudio sobre manufactura de ron [Practical results of the study on the manufacture of rum], R. ARROYO (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 3, pp. [3, 8], figs. 3).—The author improved the mash by a study of the fermentative organism, the starting materials, and the method of carrying out the fermentation. As a result of this work, at least one distillery on the island obtains a fermentative efficiency of 90 percent or more. The difficulty with disagreeable odor in the raw rum was obviated in part by correct fermentative methods, but the use of a separator type of centrifuge was of still greater importance for this purpose. Careful studies of the curing process have resulted in methods whereby aging is accomplished in half the usual time. Three new types of rum have been created and will shortly be put on the market.

An automatic zero pipette for dispensing sterile culture media, N. E. RIGLER and G. A. GREATHOUSE. (Tex. Expt. Sta. and U. S. D. A.). (*Science*, 92 (1940), No. 2390, pp. 363-364, fig. 1).—An all glass automatic zero pipette which can be sterilized in the autoclave along with the flask of culture medium is described. Exactly measured quantities of medium can be dispensed rapidly under aseptic conditions.

AGRICULTURAL METEOROLOGY

Weather prediction, R. M. LESTER (*London: Hutchinson's Sci. & Tech. Pubs.*, [1940], pp. 256, [pls. 10], figs. [20]).

The Weather Bureau—fifty years of progress, F. W. REICHELDERFER (*Sci. Mo.*, 53 (1941), No. 5, pp. 482-485, figs. 4).

Monthly Weather Review [March-May 1941] (*U. S. Mo. Weather Rev.*, 69 (1941), Nos. 3, pp. 71-93, pls. 11, fig. 1; 4, pp. 95-144, pls. 11, figs. 19; 5, pp. 145-167, pls. 10, figs. 5).—In addition to the usual detailed summaries of meteorological, climatological, solar radiation, and sunspot data, No. 4 contains the following contribution of interest to agricultural meteorology: A Summary of Total Solar and Sky Radiation Measurements in the United States, by I. F. Hand (pp. 95-125).

[**Meteorological data for Tifton, Ga.**] (*Georgia Coastal Plain Sta. Bul.* 31 (1940), pp. 12-13).—Tabulations are presented of rainfall in inches by months and years, 1923-39; dates on which first and last killing frosts occurred and the number of growing days, 1923-39; and temperatures by months, 1939.

Precipitation in the Muskingum River Basin, January-December 1940 (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1940, pp. 25, figs. 20; pp. 25, figs. 20; pp. 26, figs. 21; pp. 27, figs. 22; pp. 30, figs. 25; pp. 32, figs. 27; pp. 26, figs. 21; pp. 26, figs. 21; 1941, pp. 18, figs. 14; pp. 24, figs. 20; pp. 20, figs. 21; pp. 27, figs. 23).—Monthly records and charts are presented.

Distribution of torrential rainfalls in the United States, S. S. VISHNER (*Sci. Mo.*, 53 (1941), No. 5, pp. 410-416, figs. 2).

Probability of recurrence of Ohio River floods, C. F. JOHNSON (*Pub. Works*, 70 (1939), No. 4, pp. 9-11, figs. 2).

SOILS—FERTILIZERS

[Soil investigations by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1940, pp. 15, 91-93, 148-150, 173-175, 196-198, 199-200, 200-201, 259-260).—Progress on the effect of treatment with various chemicals, as well as vitamin B₁, on nitrification, by G. S. Fraps and A. J. Sterges; and the status of soil-survey work in Cherokee, McLennan, and Uvalde counties, by H. M. Smith, I. C. Mowery, W. T. Carter, E. H. Templin, A. L. Nabors, and C. A. Mogen.

Cooperative investigations in soil and water conservation are reported from the Tyler Substation; from the Temple Substation, by H. O. Hill; and from the Spur Substation, by R. E. Dickson and C. E. Fisher. Investigations from the Weslaco Substation on acid sulfur composts, high-sulfur in comparison with low-sulfur composts, varied sulfur compost mixes, and acid sulfur compost in comparison with aluminum sulfate for soil acidification are reported by G. H. Godfrey and H. Rich; and progress in studies of soil sterilization by fumigation is reported by Godfrey.

Interpretation of soil conservation data for field use, D. D. SMITH. (Mo. Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 5, pp. 173-175, figs. 4).—The author presents an outline and discussion of the various factors which affect soil loss and run-off. An equation is given which provides for the effect of soil-climate-crop treatment, length and degree of slope, and mechanical conservation practices on soil loss. It is suggested that a soil loss of not more than 4 tons per acre per year is a rate which would allow maintenance of fertility with approved cropping practices. Soil loss from contouring, rotation strips, and from terracing is estimated to be 57, 25, and 3 percent, respectively, of that from up-and-down-hill operation.

The conductometric method of determining the soluble salt content of soils for use in soil survey work, R. C. HOON, J. K. MALHOTRA, and L. C. JAIN (*Jour. Indian Chem. Soc.*, 18 (1941), No. 2, pp. 103-111, figs. 2).—A suggested procedure for carrying out the method, as well as results of a test of the method, of determining the soluble-salt content of a set of soils obtained from different parts of India is reported.

Soil survey of the Sacramento-San Joaquin delta area, California, S. W. COSBY. (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.]*, Ser. 1935, No. 21, pp. 48, pls. 2, figs. 2, map 1).

Soil survey of Greenbrier County, West Virginia, A. J. VESSEL ET AL. (Coop. W. Va. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.]*, Ser. 1937, No. 3, pp. 84, pls. 2, figs. 3, map 1).

Terrace dimension changes and the movement of terrace ridges resulting from different farming practices, L. H. SCHOENLEBER (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, SCS-TP-40, pp. [1]+21, pls. 2).—Results are reported on changes in terrace dimensions resulting from farming operations connected with growing various crops on broad-base terraces. Performing all tillage operations parallel to the terrace ridge and plowing by back furrowing to the ridge will probably result in increased terrace cross section. Terrace ridges did not creep down the hill slope and did not change their relative locations with respect to other terraces under the farming practices used in this study.

Field measurements of water movement through a silt loam soil, N. E. EDLEFSEN and G. B. BODMAN. (Calif. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 713-731, figs. 9).—In an experiment where evaporation and

transpiration were prevented, the authors investigated the magnitude of the vertical flow of moisture across various horizontal planes. The experiments were carried on with a silt loam of the Yolo series. The downward flow of moisture under the influence of gravity greatly decreased with time. During certain seasons of the year the downward movement was increased, while during the other seasons of the year there was actually an upward movement. These differences in water movement are explained as probably being caused by the effects of temperature differences in the soil column on the surface tension and vapor pressure of the soil moisture. Calculation of over 180 velocities of water flow across 18 different planes in the soil column showed a range in average velocities from 5.9 to 0.000044 in. per day.

Uptake and retention of water by soil as determined by distance to a water table, L. A. RICHARDS. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 778-786, figs. 5).—Results are presented on the rate at which several soils would absorb water and equilibrium moisture contents that would be obtained at soil-moisture tensions corresponding to various distances from a water table. An apparatus is presented for obtaining sorption and desorption curves for soils over a 1-atmosphere tension range. It is pointed out that moisture movements in soils are quite different when it is a drying and when it is a wetting process, the wetting process taking place at much slower rates under corresponding moisture conditions.

Selenium occurrence in certain soils in the United States, with a discussion of related topics.—Sixth report, H. W. LAKIN and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul.* 783 (1941), pp. 27).—This continuation of a series of reports previously noted (*E. S. R.*, 85, p. 314) discusses the selenium content of Cretaceous shales, soils, and vegetation in California, New Jersey, and Maryland. All these materials are of small selenium content. The Permian beds of Oklahoma are likewise low in selenium. An area of seleniferous soils which are produced from quaternary alluvium is reported from Nevada and indicates the probability of other similar deposits elsewhere. Data upon the selenium content of sea-floor samples from the Gulf of California and from the Pacific Ocean off southern California are reported, and the general distribution of selenium in the soils and plants of the Lower Brule Indian Reservation in South Dakota is reported and discussed. The existence of measurable quantities of selenium in the atmospheric dusts of cities is noted. A brief discussion of the modes of accumulation of selenium in soils is presented.

Beneficial influence of earthworms on some chemical properties of the soil, Y. C. PUH (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser.*, 15 (1941), No. 9, pp. 147-155; *Chin. abs.*, p. 155).—The effect of earthworm activity was investigated by a study of soils worked on and not worked on by worms. The amounts of organic matter, base-exchange capacity, total nitrogen, calcium carbonate, available phosphorus, and available potassium were all significantly increased because of earthworm activity. Exchangeable calcium was not found to be affected. The reaction of the earthworm castings was found to be made more alkaline whether the parent soil was acid or alkaline.

Some contributions to soil microbiology and their influence on the development of this science, F. B. SMITH. (Univ. Fla.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 349-351).—A general review of the scope of soil microbiology.

A place for the plate count method as applied to soil, N. JAMES and M. L. SUTHERLAND (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 375-383, fig. 1).—A general discussion of the plate-count method for determining bacterial numbers in the soil. Suggestions are made for reducing errors involved in the various steps of the method.

An identification scheme for numbering cultures of Rhizobia, L. W. ERDMAN (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 425-432).—An identification scheme is proposed by the author to assist in standardizing the labeling of legume bacteria cultures.

Notes on types of bacteria associated with plant roots, F. E. CLARK. (U. S. D. A. and Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 75-84).—Results are reported on a comparison of micro-organisms in the soil and around the root zone of cotton, cereal, and garden plants.

Numbers of micro-organisms in relation to aggregate size, G. G. POHLMAN and R. J. NOTTINGHAM. (W. Va. Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 447-450).—Preliminary results are given which confirm the work of Myers and McCalla (E. S. R., 85, p. 163) to the effect that the stabilizing influence of micro-organisms on soil aggregates is due to their products rather than to the organisms themselves.

Studies of different cultures of Rhizobium leguminosarum and of gypsum and straw for seed pea production, S. C. VANDECAVEYE and W. H. FULLER. (Wash. Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 415-423).—The authors report the effect of different cultures of *R. leguminosarum* and of applications of gypsum and wheat straw on the growth and yield of seed peas on Palouse silt loam. Out of seven different cultures investigated, two were found to result in increased yields that approached significance statistically, even though the soil in the experimental area was found to contain a sufficient number of *R. leguminosarum* to bring about effective inoculation of the peas. Large quantities of straw and different amounts of gypsum placed in contact with the seed under greenhouse conditions had no detrimental effect on seed germination. Furthermore, the treatments had no marked influence on the effectiveness of the *R. leguminosarum* culture used for seed inoculation either in producing root nodules or in benefiting the growth of the host plant.

Soil respiration studies on the decomposition of native organic matter, W. B. BOLLEN. (Oreg. Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 353-374, figs. 4).—The decomposition of native organic matter of several soils was investigated by the respiration method. The influence of moisture and the addition of available nitrogen was also determined. The optimum moisture content for soil respiration was found to be about 75 percent of the saturation capacity. The author suggests that for CO₂ production, as a microbial function, the optimum moisture may range between wide limits, but for strictly aerobic processes it is more sharply defined. Increased respiration was brought about by the addition of available nitrogen in a soil containing organic matter with a wide carbon : nitrogen ratio. In certain soils CO₂ respiration was depressed by the addition of nitrates. The author suggests reasons for this depressive action. The microbial population of the various soils, which represented distinct taxonomic groups as well as similar soils within a group, was not found to be greatly different either at the beginning or the end of the long incubation period.

Soil changes associated with tillage and cropping in humid areas of the United States, E. P. WHITESIDE and R. S. SMITH. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 765-777).—In the review of the literature, differences between cultivated and uncultivated areas of a prairie soil are reported. No difference in mechanical composition of virgin and cultivated profiles was found, but cultivated areas had less organic carbon, base-exchange capacity, and exchangeable bases in the upper 12 in. of the profile. The decreased exchange capacity of the tilled soil is reported as due mainly to a lower organic-matter content.

Contributions to the nitrogen economy of Australian wheat soils, with particular reference to New South Wales, H. L. JENSEN (*Linn. Soc. N. S. Wales, Proc.*, 65 (1940), pt. 1-2, pp. 1-122, pl. 1, figs. 5).—A comprehensive investigation is reported on the distribution and numbers of nitrogen-fixing bacteria in Australian wheat soils and the nitrogen-fixing capacity in pure culture and nitrogen fixation experiments with soils under laboratory conditions, supplemented with experiments on nitrification in soils, also under laboratory conditions. As a general conclusion the author indicates that there seems to be no foundation for the frequently expressed opinion that soils from arid climates have an extraordinary nitrogen-fixing power and may, through the utilization of crop residues by free-living nitrogen-fixing organisms, be permanently under cereal cultivation without depletion of nitrogen. The system of growing wheat alternating with fallow and without use of nitrogenous fertilizers must be considered as leading to a gradual consumption of the nitrogen reserves of the soil. Nonsymbiotic nitrogen fixation and the addition of nitrogen from rain only incompletely compensate for the nitrogen used for crop production. In other words, the practice of growing wheat alternating with fallow, if continued for a sufficient period of time, will lead to permanent loss of fertility. In order to overcome this condition, the use of leguminous crops in the crop rotations or a judicious application of nitrogenous fertilizers is suggested.

The availability of the potash of the soil as measured by pot experiments with corn, G. S. FRAPS and J. F. FUDGE. (*Tex. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 205-208; *abs. in Texas Sta. Cir.* 93 (1941), p. 19).—The availability of the potash of soils was studied with pot experiments by determining the quantity taken up by corn from additions of soils containing 0.5 gm. of total soil potash. A treatment of 0.25 gm. of sulfate of potash on a potash-deficient soil was compared with the treatment of 0.5 gm. of soil potash. The quantity of potash removed from the potassium sulfate was nearly twice as much as the quantity removed from any of the soils. The results indicate that the weight of the crop produced is not a good measure of availability of potash. In some soils the quantity of potash taken up by the corn was greater than the potash added to the soil. The higher the average percentages of total, acid-soluble, and active potash in the soils the greater was the amount of potash taken up by the corn plant. In general, soils containing a high percentage of potash were found to have more potash available for corn plant per unit of potash than a soil low in potash. As the average percentages of potash in the plant taken from the corrected acid-soluble potash increased, the average percentages of acid-soluble potash, phosphoric acid, lime, basicity, and pH also increased.

Factors influencing the solubility of iron and phosphorus in chlorotic and nonchlorotic areas of Hyrum clay loam, D. W. THORNE. (*Utah Expt. Sta.*). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 433-445, figs. 2).—No appreciable differences were noted in available phosphorus between the chlorotic and nonchlorotic soils. The soil in chlorotic areas was found to be more compact. Iron was more soluble in nonchlorotic than in chlorotic areas. The principal factors influencing available phosphorus, as determined by a laboratory study, were carbon dioxide-soluble calcium, total calcium carbonate, and pH.

Influence of the decomposition of organic materials on some properties of alkaline-calcareous soils, W. P. MARTIN and W. A. KLEINKAUF. (*Ariz. Expt. Sta.*). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 4, pp. 385-402, figs. 4).—The influence of the decomposition of *Sesbania*, sourclover, hegari, and Markton oats on the pH, nitrate-nitrogen content, and the degree of aggregation of

Pima clay loam, an alkaline-calcareous soil from Arizona, and of Clarion silt loam, an acid soil from Iowa, are reported.

Effect of different lime levels on the growth and composition of some legumes, H. B. VANDERFORD. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 789-793, figs. 3).—The need for calcium in successful legume production on Grenada silt loam was determined under greenhouse conditions with soybeans, Korean lespedeza, and sweetclover as indicator crops. Yields were increased with increasing additions of calcium carbonate, but not at a uniform rate for each of the three legumes. Calcium content and total calcium removed by the plants increased with each increment of calcium in all the crops. The percentage of nitrogen did not vary greatly. Phosphorus content and total amount removed by the soybeans and sweetclover decreased with increasing increments of calcium carbonate. The total amount of phosphorus removed by lespedeza increased with each addition of calcium carbonate.

The relation of liming to fertilizer efficiency, J. W. WHITE. (Pa. Expt. Sta.). (*Com. Fert.*, 62 (1941), No. 6, pp. 9-10, 12, 14-16, figs. 2).—The author discusses the influence of soil acidity upon the growth of plants, stating that the beneficial effect of applications of lime in correcting certain undesirable soil properties has been demonstrated many times. Lime is also considered in relation to the utilization of commercial fertilizers. Results with four different soils indicated the necessity of a combination with lime if maximum efficiency from commercial fertilizers is to be obtained.

Calcium-bearing versus neutral fertilizers, W. A. ALBRECHT. (Mo. Expt. Sta.). (*Yearbook Com. Fert.*, 1941, pp. 23-30, 48, figs. 10; also in *Com. Fert.*, 63 (1941), No. 3, pp. 8-15, 24, figs. 10).—A general discussion is presented on the importance of distinguishing between the value of calcium as a neutralizer of soil acidity and as a plant nutrient.

Calcium-boron ratio as an important factor in controlling the boron starvation of plants, M. DRAKE, D. H. SIELING, and G. D. SCARSETH. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 454-462, fig. 1).—An electrodialed colloid isolated from a Miami soil and an electrodialed humus extract from a Brookston loam were used to determine if boron is fixed by soil colloid in a manner similar to the fixation of the phosphate ion. Boron was added to the above soil extracts, which were adjusted to 16 different pH levels. All the boron was recovered from each of the solutions regardless of its pH or calcium concentration. It was thus concluded that boron is not absorbed by the clay or humus complexes or made insoluble with calcium. Applications of graded amounts of lime to Crosby silt loam, along with the applications of boron, nitrogen, phosphorus, and mannitol, were found to have no effect on the boron recovery. Corn and tobacco plants grown in sand cultures with two different concentrations of calcium, to which a nutrient solution containing 1 p. p. m. of boron was added after a period of growth, indicated that neither active calcium nor pH affected the uptake of boron by these plants. Turkish tobacco grown in Norfolk sand in a greenhouse was found to be normal when the calcium : boron ratio in the plants did not exceed 1,340:1. However, a calcium:boron ratio of 1,500:1 was found to cause severe boron starvation symptoms. The above findings confirm the results of other investigators which indicate that boron starvation appears when the calcium-boron in the plant becomes unfavorable.

More than lime benefits in Ruffin's results, E. O. FIPPIN (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 841-848, figs. 2).—A review of the work of Edmund Ruffin of Virginia on the effect of lime is given. It is pointed out that it is

not reasonable to expect that the phenomenal increases in crop yields secured by Ruffin and his associated planters could have been secured from the use of carbonate of lime alone. It is suggested from examination and chemical analysis that the marl deposits used by Ruffin contain materials other than lime. The shell deposits were associated with greensand marl, which may carry varying proportions of phosphate, of lime, as well as some potash and gypsum, which would be especially valuable for the growth of clover.

Factors affecting the caking of fertilizers, J. R. ADAMS and W. H. ROSS. (U. S. D. A.). (*Amer. Fert.*, 95 (1941), No. 2, pp. 5-8, 22, 24, figs. 5).—In the investigations reported, the time of storage was found to have a marked effect on the crushing strength of cakes of sodium nitrate but only a relatively small effect on cakes of other materials. Slight changes in moisture content were found to have a greater effect on the caking of water-soluble fertilizers than correspondingly small changes in any of the other factors that affect their tendency to cake. Finely divided materials may cake as a result of cohesion or adhesion between the particles, but it is pointed out that most fertilizer materials are not sufficiently divided to undergo caking in this manner. The general condition of caking is brought about by a knitting together of the crystals of which the mixture is composed. This knitting together occurs when a material, such as ammonium nitrate, undergoes a change in crystal form, when the crystals flow together under pressure, when a material crystallizes from the solution phase, when new crystals are formed as a result of chemical reaction between the components of a mixture, or when a material combines with the free water present to form a compound containing water of crystallization.

AGRICULTURAL BOTANY

Èkspèrimental'nàâ botanika [Botanical experiments] (*Trudy Bot. Inst. Akad. Nauk SSSR, Èkspèr. Bot. (Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.)*, 4. ser., No. 5 (1941), pp. 296, figs. 106).—The following papers are included: *Mekhanicheskiî aspirator* (A Mechanical Aspirator) (pp. 6-13, Eng. abs. p. 13), and *Metod izuchenîâ transpiratsii odnovenno s fotosintezom* (A Method for Studying Transpiration Simultaneously With Photosynthesis) (pp. 14-21, Eng. abs. p. 21), both by A. N. Danilov; *Metody radiatsionnykh izmerenii dliâ èkologicheskikh tselèi* (Methods of Radiation Measurement for Ecological Studies), by Û. D. Ānishevskii (G. D. Janishevsky) (pp. 22-45, Eng. abs. p. 45); *K voprosu ob izuchenii radiatsionnykh svoistv list'ev rastenii* (About Studying the Radiative Properties of Plant Leaves), by N. N. Kalitîn (pp. 46-54, Eng. abs. p. 54); *Novàâ metodika vyrashchivaniâ rastenii pri raznoi temperature pochvy i vozdukhâ* (A New Method of Growing Plants Under Different Temperatures of Air and Soil), by S. Ī. Radchenko (Radtchenko) (pp. 55-71, Eng. abs. pp. 70-71); *Sravnitel'noe issledovanie ènergii fotosinteza u muzhskikh i zhenskikh rastenii konopli* (A Comparative Study of the Photosynthetic Activity in Male and Female Hemp Plants), by O. A. Val'ter (Walther), M. F. Lilienshtern (Lilienstern), and Z. A. Chizhevskàâ (Tchijevskaja) (pp. 72-87, Eng. abs. pp. 86-87); *Zavisimost' svetovykh i temnovykh reaktsii fotosinteza ot stepeni ovodneniâ assimilatsionnoi tkani* (Influence of the Hydration Degree of the Assimilatory Tissue on the Photochemical and Dark Reactions in Photosynthesis), by V. (B.) A. Brilliant and M. N. Chrelashvili (Tchrelaschwili) (pp. 88-100, Eng. abs. p. 100); *Vliânie soderzhanîâ vody i nakoplenîâ assimilâtov v liste na ènergiu fotosinteza i dykhanîâ* (The Influence of Water Content and Carbohydrate Accumulation on the Energy of Photosynthesis and Respiration), by M. N. Chrelashvili (Tchrelaschwili) (pp. 101-137, Eng. abs. p. 136-137); *K voprosu o roli sredy v foto-periodicheskoî reaktsii korotkodnevnykh rastenii* (On the Role of the Environ-

ment in the Photoperiodic Reaction of Short-Day Plants), by E. Ī. Ermolaeva (E. J. Ermolaieva) and O. A. Shcheglova (Szeglova) (pp. 138-150, Eng. abs. pp. 149-150); K voprosu o roli srede v period tsvetenĭia i plodonosheniĭa rasteniĭa (On the Role of the Environment in the Periods of Flowering and Fruiting), by O. A. Shcheglova (Szeglova) and E. Ī. Ermolaeva (E. J. Ermolaieva) (pp. 151-162, Eng. abs. pp. 161-162); Analiz fotoperiodicheskoĭ reaktsii u redisa (Analysis of the Photoperiodic Reaction in Radish), by S. D. L'vov (Lvoff) and Z. N. Obukhova (S. N. Obuchova) (pp. 163-197, Eng. abs. pp. 195-197); Vliĭanie mineral'nykh udobrenĭi na morozostoičnost' tsitrusovykh (The Influence of Mineral Nutrition on the Frost Resistance of Citrus Plants), by K. S. Semakin and E. S. Moroz (pp. 198-219, Eng. abs. p. 219); Zakalivanie ĭarovykh zlakov k atmosfernoĭ zasukhe (Hardening of Spring Cereals Against Atmospheric Drought), by E. S. Moroz (pp. 220-257, Eng. abs. p. 257); and Ėkstrafloral'nye nektarniki u ivy (The Extrafloral Nectar-Glands of *Salix*), by D. E. Īanishevskĭĭ (Ivanishevsky) (pp. 258-294, Eng. abs. pp. 292-294).

A precision fine adjustment for standard microscopes, D. H. HAMLY (*Science*, 94 (1941), No. 2437, pp. 263-264, fig. 1).

Biological stains: A handbook on the nature and uses of the dyes employed in the biological laboratory, H. J. CONN (*Geneva, N. Y.: Conn. Standardization Biol. Stains*, 1940, 4. ed., rev., pp. 308).—In this edition there has been less new material added (13 dyes) than in the two preceding, partly because the third edition (E. S. R., 76, p. 438) covered the field more completely than the first two and partly because there seem to have been fewer suggestions recently as to new dyes to employ in biological work. "The book has, nevertheless, been given a very careful revision so as to bring the statements in it up to date and to correct errors that had escaped attention in connection with either of the other revisions."

Method for softening filbert buds imbedded in paraffin, C. E. SCHUSTER (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 4, pp. 815-817).—The method reported as successful involves soaking imbedded material in small blocks in water for at least 6 mo., then holding them for 2 or more weeks in open dishes containing a bacterial suspension prepared by placing dead and decaying straw and grass in a dish with a solution of 0.5 gm. NH_4NO_3 in 1,000 cc. of water. The imbedding procedure and other details are given.

Flowers and flowering plants: An introduction to the nature and work of flowers and the classification of flowering plants, R. J. POOL (*New York and London: McGraw-Hill Book Co.*, 1941, 2. ed., pp. XXIII+428, [pl. 1], figs. [224]).—This book is largely the outcome of a "vigorous and constant desire to interest college students and others in the essential nature, development, and classification of flowering plants" for over three decades. It is intended for students who have had an introduction to general botany, but it is believed that it will be fully understood by anyone who is willing to take it up studiously and in its entirety. The outstanding feature of the treatment of the families is seen in the use of new types of graphic formulas and charts to depict floral anatomy and evolution.

Flower coloration, T. A. GEISSMAN. (Univ. Calif.). (*Jour. Chem. Ed.*, 18 (1941), No. 3, pp. 108-110).—A review of the chemistry and genetics of flower pigments.

Lignin content of citrus wood.—A progress report, F. M. TURRELL and P. L. FISHER. (Calif. Citrus Expt. Sta. et al.). (*Calif. Citrogr.*, 26 (1941), No. 9, pp. 254, 273, fig. 1).—A number of uses that may be made of lignin are listed, and its possible relation to granulation of the fruit is discussed. The lignin content of various species and varieties of healthy citrus woods on different

rootstocks assayed 12.65–17.35 percent of their dry weight by the Phillips method and 12.99–21.82 percent by the Ritter method. Valencia orange scions with psorosis averaged slightly less lignin when there were bark symptoms than when none were visible. Twigs from Valencia scions on sour orange stock averaged 11.87 percent lignin.

Rosha grass oil, J. C. LUTHRA (*Cur. Sci. [India]*, 10 (1941), No. 6, pp. 305–306, figs. 11).—Notes on six oil-producing grasses, with special reference to *Cymbopogon martini* from which the fragrant palmarosa oil (containing geraniol) is obtained for use in manufacturing perfumes and scented toilet soaps.

The induction of fertility in genetically self-sterile plants, W. H. EYSTER (*Science*, 94 (1941), No. 2432, pp. 144–145).—Work with Golden Rose petunia indicated that its self-sterility is due to slow growth of pollen tubes, caused by an ovarian secretion, and formation of an abscission layer between style and ovary before the tubes enter the latter. Seed capsules filled with viable seeds were, however, produced in this variety by spraying the flowers with α -naphthaleneacetamide (10 p. p. m. in water) at about the time of self-pollination. The same spray materially increased self-fertility in African marigold, cabbage, and red clover, suggesting that perhaps a great variety of economically important plants, normally self-sterile or self-incompatible, may be made self-fertile in a similar way.

Validity of equations for relative growth constants when applied to sigmoid growth curves, R. PRATT. (Univ. Calif.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 5, pp. 295–304, figs. 7).—Application of the Huxley equation $y = bx^k$ to express the relative growth rates of different organs often reveals interesting relations, but its use is restricted. When found to fit the observed data, the parts of the growth cycles to which it applies should be accurately defined, because for other parts the slope of the logarithmic curve (k or “relative-growth constant”) may be quite different. Logarithmic plotting of growth data by the Huxley formula is said to be an unsatisfactory substitute for the original data plotted as time curves. If the growth cycles of the two quantities coincide in time and follow the sigmoid course of the curve for an autocatalytic monomolecular reaction characteristic of the growth of many multicellular organisms, the k value by the Huxley equation is 1. The value of y then remains a simple multiple of x , i. e., $y = bx$. When the total growth periods are unequal or when they are equal but do not coincide in time, a straight line cannot accurately fit all of the points, though isolated portions of the growth cycles may yield curves that are approximately linear over relatively wide ranges. The slopes may have very different values for the first and last parts of the growth cycles, however, approaching a value of zero as the curve becomes horizontal, or increasing without limit as it approaches a vertical position. A sharp break in the relative-growth curves does not necessarily indicate a fundamental physiological change in the organism as some have suggested, but may be merely the inevitable consequence of comparing two quantities whose periods of increment are not entirely concurrent. The statements presented refer especially to relative-growth constants of quantities that increase as sigmoid functions of time and are not intended to apply to other types of growth curves, although it is possible they could be extended to other cases. The statements and conclusions are supported empirically by “ideal” curves calculated from equations commonly employed in growth studies and by curves constructed from data in the literature. There are 21 references.

¹ Problems of relative growth, J. S. Huxley. New York: Dial Press, 1932, pp. XIX+276, pl. 1, figs. 104.

Responses of vegetative parts of plants following application of extract of pollen from *Zea mays*, J. W. MITCHELL and M. R. WHITEHEAD. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 4, pp. 770-791, figs. 12).—Corn-pollen extracts in lanolin were applied to certain vegetative parts of various plant species, particularly *Phaseolus*. Application as a ring around the stems of bean plants resulted in marked internodal elongation, associated mainly with an increased cell length. Small amounts of indoleacetic acid applied similarly also resulted in increased linear growth of internodes, but to a less extent. Greatest increase in linear growth of bean stems occurred when the pollen extract was applied to internodes of plants grown in light of intensity and quality most favorable for developing short sturdy stems, and there was little or no difference in internodal elongation of treated and control plants grown under light conditions favoring etiolation. Small tumors generally followed application of the pollen extract to the cut surface of decapitated second internodes of bean plants, but the associated histological responses were unlike those following application of relatively concentrated mixtures of indoleacetic or naphthaleneacetic acids and lanolin, more closely resembling those recorded for tryptophane. There are 23 references.

The effects of wounding and wound hormones on root formation, C. D. LARUE (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 8, pp. 388-392).—In coleus petioles and in herbaceous cuttings of several other plants tested, wounding greatly increased adventitious-root production. Treatment with extracts containing wound hormones strongly stimulated root formation in woody cuttings. Both wounding and treatment with extracts containing wound hormones shortened the time required for rooting of cuttings. The effect of wounding on root initiation appeared to be nearly as great as that of treatment with indolebutyric acid.

Biotin and the growth of *Neurospora*, E. T. BUTLER, W. J. ROBBINS, and B. O. DODGE (*Science*, 94 (1941), No. 2437, pp. 262-263).—Five races of this fungus genus were found biotin-deficient and requiring biotin in the medium for growth. On a synthetic medium containing biotin only two of the races produced mature ascospores abundantly. These races were nonconidial. Additional factors appeared to be necessary for free ascospore production in other races.

Responses of sunflower stems to growth-promoting substances, J. L. BLUM. (Univ. Mo.). (*Bot. Gaz.*, 102 (1941), No. 4, pp. 737-748, figs. 10).—Certain responses were common to treatment of a decapitated surface with all five growth-promoting acids (in lanolin) tried, among them the formation of parenchymatous or meristematic callus at the exposed surface of the pith, parenchyma of the xylem, phloem, and cortex (especially of the endodermis), and increased secondary thickening near the apex of the stump. The conducting elements of the xylem and phloem, the pericycle, and the epidermis failed to react. A horizontal cambiumlike tissue was formed soon after treatment which connected with the true cambium at the cut edges of the latter, forming a platelike meristem across and within the callus. Cells which it formed to the lower side developed into tracheids. Characteristic and specific responses are also enumerated for indoleacetic, indolebutyric, indolepropionic, naphthaleneacetic, and phenylacetic acids.

Effectiveness of tryptophane mixtures as growth regulators, W. S. STEWART. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 4, pp. 801-805, figs. 2).—It having been shown by Kraus (*E. S. R.*, 85, p. 320) that a lanolin mixture containing 2 percent by weight of *l*-tryptophane is capable of inducing gall formation when applied to the cut surface of decapitated bean seedlings, the author extended the studies to other lots of tryptophane and different methods of mixing and

applying. From this work it is concluded that in preparing lanolin-tryptophane mixtures (and probably other growth substances as well) considerable care should be taken to assure a uniform, finely divided dispersion of the substance in the lanolin, and that results may vary greatly with the character of the mixture. Whether the tryptophane was changed or whether there were other substances present in the original samples used remains to be determined, but if the latter was true it was apparently true of all the samples used.

Growth regulators of plants and formative effects induced with β -naphthoxy compounds, P. W. ZIMMERMAN (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 8, pp. 381-388, pls. 2, fig. 1).—The regulatory and formative effects of treatment of several plant species with β -naphthoxyacetic acid were compared with those induced by other growth substances, the principal differences having to do with modifications of new organs. This acid and its derivatives were effective when applied either in solution or as a vapor. The new leaves, flowers, and fruit appearing after treatment were modified in size, shape, and pattern, and the veins became transparent. The latter response was compared to the symptoms of virus infections. In time, treated plants recovered from the chemical influence and again produced normal leaves and flowers. The naphthoxy compounds were particularly effective for inducing parthenocarpy and thereby causing seedless fruit to develop, a few drops liberated as vapor at one end of a greenhouse being sufficient to set seedless fruit on flower clusters of tomatoes distributed over the entire house.

Formative effects induced with β -naphthoxyacetic acid, P. W. ZIMMERMAN and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 1-14, figs. 4).—When several species of plants were treated with this acid the principal differences in response concerned modifications of new organs formed thereafter. The venation pattern and leaf form in tomato, hibiscus, mimosa, artichoke, Paris daisy, tobacco, and marigold were modified when the acid or its derivatives were sprayed on the growing tips of the plants, this change occurring only in parts formed after treatment. In many respects the leaves of tomato resembled those of virus-diseased or mite-infested plants. Clearing of the veins was pronounced in hibiscus, tomato, artichoke, Paris daisy, and tobacco leaves. Mimosa leaves became fasciated or fernlike. Plants exposed to naphthoxyacetic acid first showed pronounced epinasty of leaves and growth was inhibited for a few days, but the new leaves developed thereafter exhibited the characteristic modifications for the species. Solutions of the acid applied to the soil brought out all the characteristics described for sprays and vapors, but even more pronounced and lasting. The flower buds of plants treated via the soil were abnormally long, with a decided calyx tube. Parthenocarpic development of tomato fruit was induced when flowers or well-developed buds were sprayed with emulsions or solutions of the acid, the ovaries often enlarging before the flowers opened. In some cases both stamens and petals remained in good condition for 21 days, whereas controls withered within 3 days after the flowers opened. Compared with other growth substances, naphthoxyacetic acid has several advantages for practical production of seedless tomatoes and possibly of other fruits.

Formation of β -2,2,2-trichloroethyl-gentiobioside in tomato plants grown in media containing chloral hydrate, trichloroethyl alcohol, or chloral cyanohydrin, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 15-23).—"The tops and roots of tomato plants, grown in a medium to which chloral hydrate had been added, were found to contain a chlorine-containing β -glycoside which was obtained in crystalline form as the acetyl and as the propionyl derivative. The same β -glycoside was obtained when trichloro-

ethyl alcohol instead of chloral hydrate was added to the nutrient medium. Through the synthesis of β -2,2,2-trichloroethylgentiobioside heptaacetate and heptapropionate, which were prepared for the first time, this glycoside has been shown to be β -trichloroethylgentiobioside. β -Trichloroethylgentiobioside is also formed from absorbed chloral cyanohydrin. It thus appears that the tomato readily reduces trichloroacetaldehyde to the corresponding alcohol. With chloral cyanohydrin, hydrolysis apparently precedes the reduction. Quantities of β -trichloroethylgentiobioside up to 1 gm. per 100 cc. of expressed juice were present in the plants grown with added chloral hydrate."

Synthesis of β -2-chloroethyl-d-glucoside by wheat plants grown with ethylene chlorohydrin added to the nutrient medium, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 25-28).—A Cl-containing β -glycoside was formed in both roots and tops of wheat grown in a medium containing ethylene chlorohydrin. This glycoside is shown to be a β -2-chloroethyl-d-glucoside through the preparation of the acetyl derivative which was found to be identical with synthetic β -2-chloroethyl-d-glucoside tetraacetate.

Synthesis of β -2,2,2-trichloroethyl-gentiobioside by gladiolus corms treated with trichloroethyl alcohol, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 29-30).—Gladiolus corms were shown to form β -2,2,2-trichloroethylgentiobioside from absorbed trichloroethyl alcohol.

Some X-ray observations regarding the membrane structure of halicystis, W. A. SSSON (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 31-44, figs. 3).—This report of the identification of mercerized cellulose in a marine alga is of both biological and chemical interest, since it is believed to be the first example of a plant membrane subjected to X-ray diffraction analysis which shows the cellulose to exist in the mercerized form.

Control of water transport in local root regions of attached and isolated roots by means of the osmotic pressure of the external solution, H. F. ROSENE (*Amer. Jour. Bot.*, 28 (1941), No. 5, pp. 402-410, figs. 4).—Expressed as osmotic pressure, the range of critical concentrations of sucrose and KNO_3 balancing the internal factors determining the rate of water transport across the epidermal boundary of local root regions in onion tests was 4.2-5.7 atmospheres for attached roots and 1.8-3.3 for isolated roots and root segments. Solutions with osmotic pressures of 5.14 and 2 atm., respectively, stopped absorption in one or more local regions in the majority of attached and isolated roots at 25° C. and 100 percent relative humidity. When leaves but not roots were exposed to light and air at 50 percent relative humidity and 25°, absorption by local root regions ceased when the osmotic pressure of the external solution was 6.5 atm. There was no pronounced difference between osmotic pressures stopping apical v. basal water entry. Abrupt decrease or increase in rate of absorption at a local region occurred when a solution of threshold concentration was applied to or removed from the region after or before application of distilled water or culture solution. "Rebound" phenomena were noted when a threshold or stronger concentration of sucrose surrounding a local region was replaced by distilled water or culture solution.

Evidence for carotenoid-sensitized photosynthesis in the diatom *Nitzschia closterium*, H. J. DUTTON and W. M. MANNING. (*Univ. Wis.*). (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 516-526, figs. 6).—Using the dropping mercury electrode, the highest yields were around 0.1 molecule of O_2 per quantum absorbed. The evidence was that carotenoid photosynthesis probably utilizes the same enzyme system as does chlorophyll photosynthesis.

On the mechanism of photosynthesis in purple bacteria and green plants, K. WOHL (*New Phytol.*, 40 (1941), No. 1, pp. 34-55, figs. 6).—A scheme for photo-

synthesis is proposed in which the product of the photoprocess in its narrowest sense reacts with an enzyme in a collision reaction. The enzyme is attached to the photoproduct for a very short time only and then is released in the form of a compound with a final product of assimilation. After some time the enzyme and the product of assimilation separate. The ratio of the mean period of this process of separation to the mean period of the collision reaction determines the shape of the assimilation curve, which can vary between the normal hyperbolic form and a broken line of the Blackman type. Further Blackman reactions can be included in the scheme. In every case the shape of the curve is the same for the two variables, light intensity and CO₂ concentration, provided there are not external circumstances which bring about a difference, and in every case a good quantum efficiency is allowed for at high CO₂ concentration and low light intensity. The scheme is able to reproduce the sigmoid assimilation curve obtained by C. S. French² for a purple bacterial species if it is supposed that the three intermediates of the 4-quanta-photoprocess are unstable. By analysis with this scheme it is found that the capacity of one pigment molecule for photosynthesis in continuous light is of about the same magnitude in purple bacteria as in green plants, making it probable that the photosynthetic unit exists also in purple bacteria. Other mechanisms bringing about similar effects, some of which have been suggested as alternatives to the theory of the photosynthetic unit, are disclosed. No satisfactory alternatives appear to exist at present.

Further studies of the photoperiodic behavior of some mints (Labiatae), H. A. ALLARD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 1, pp. 55-64, figs. 7).—The length-of-day requirements of a number of strains of *Monarda punctata*, *M. didyma*, *Mentha arvensis*, *M. spicata*, *M. piperita*, and *M. citrata* were studied in Virginia at about latitude 39° N. The first two species flowered readily under all light periods from 10 to 18 hr., behaving as day-neutral plants. The *Mentha* species are mostly long-day plants, since flowering was usually hastened by lengthened days. The strain of *M. piperita* grown showed the most pronounced requirement for long days, since 13 hr. of daylight each day failed to initiate flowering and the plants scarcely flowered with 14 hr. of light each day. The lower limits of flowering for *Mentha* species also showed considerable variation, *M. citrata* failing to flower with 12 hr. light daily and *M. spicata* with 10 hr.

Influence of localized low temperature on Biloxi soybean during photoperiodic induction, H. A. BORTHWICK, M. W. PARKER, and P. H. HEINZE. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 4, pp. 792-800, figs. 2).—Fewer flower buds were formed in response to a 4-day induction treatment on plants with a single leaf when the terminal buds or the petioles were cooled to 3° C. than when not cooled. When raised to 10°, the inhibiting effect on flowering decreased in both types of experiments, but even at this temperature only slight growth of the terminals occurred during the induction treatment. Petiole-cooling tests involving plants with two leaves indicated that inhibition of flowering results from the influence of low temperature on the transport of a flower-forming stimulus.

Electrolytes and nuclear structure of the cells of the onion bulb epidermis, R. CHAMBERS and M. BLACK (*Amer. Jour. Bot.*, 28 (1941), No. 5, pp. 364-371).—In onion cells two types of visible structureless nuclei were noted, viz, (1) vitreous nuclei, homogeneous but highly refractive, and (2) phantom nuclei, hyaline and appearing like an empty space surrounded by cytoplasm. The former appear infrequently among the nuclei of plasmolyzed cells, and

² Jour. Gen. Physiol., 23 (1940), No. 4, pp. 483-494, figs. 7.

their cyclosis is either erratic or irreversibly stopped. Phantom nuclei appear in large numbers on deplasmolysis of cells previously exposed (when plasmolyzed) to optimum concentrations of certain electrolytes. Plasmolysis with neutral sucrose solutions in general produced no visible effect on the granulated, brain coral-like structure of the nucleus except for the infrequent appearance of vitreous nuclei. Definite and reproducible production of phantom nuclei was obtained on deplasmolysis of cells exposed (when plasmolyzed) to H^+ (pH 4.5-5); Cs^+ , Rb^+ (0.006 M); K^+ (0.012 M); Ca^{++} (0.36 M); and NaOH and NH_4OH at pH 8.8-9. A definite degree of plasmolysis had to be attained before a positive effect of the electrolytes inducing phantom nuclei could occur. In onion cells the normal tonicity was 0.65 M. Phantom nuclei were not produced by NH_4Cl (pH 7), NH_4 acetate (pH 7), NaCl and LiCl. A tendency to decrease the distinctness of the nuclei was in the order $NH_4 > NaCl > NH_4$ acetate $> LiCl$. The toxicity of the salts was in the order: Cs and $RbCl > KCl > NH_4Cl > NaCl > Na$ acetate $> CaCl_2$ and LiCl. Leaf cells of *Tradescantia*, different from onion cells in losing structure when plasmolyzed in neutral sucrose solutions and regaining it when deplasmolyzed, will, if plasmolyzed in acid sucrose solutions (pH 4.5-5), develop reversible phantom nuclei on deplasmolysis.

Metabolism of non-volatile organic acids in excised barley roots as related to cation-anion balance during salt accumulation, A. ULRICH. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 526-537, figs. 8).—Using a technic described for growing seedlings in darkness under controlled conditions and with all studies of excised roots (except those relating to time) conducted within an 8-hr. period during which but little bacterial activity developed, it was found that when the excised roots absorbed cations in excess of anions from the salt in culture solution, and provided that an ample supply of sugar was available in the cells, organic acids were formed as a response to the tendency toward an increase in pH of the root sap. With the converse absorption of ions, the organic acids tended to disappear, leaving the base to balance the increase in inorganic anions. The changes in organic acid content of the roots produced by shifts in relative cation and anion absorption were reflected in the respiratory quotients, the latter being less than one when organic acids were formed and greater when they decreased in amount. It is thus inferred that the acids were associated with respiration. Production of organic acids in excised barley roots was not correlated with ammonia or amide formation, as would be necessary to support the theory of acid production through oxidative deamination of amino acids. The organic acid adjustments to changes in the acid-base balance in the roots cells are rapid, in most cases the major changes being realized before the end of an 8-hr. period.

Plant nutrient deficiency symptoms: Physiological basis, E. E. DETURK. (Univ. Ill.). (*Indus. and Engin. Chem.*, 33 (1941), No. 5, pp. 648-653, figs. 2).—The author concludes from this study that the most frequently observed cases of malnutrition are those of deficiencies of one or more essential elements, which may be interpreted as excesses of the elements not deficient. Deficiency may be due to insufficient supply in the soil, insufficient solubility rate, or physiological unavailability within the plant or between the plant and its environment. The symptoms are grouped roughly into inhibited growth, color changes, necrosis, and malformations. Plant nutrient deficiencies produce symptoms indirectly, as the result of a series of physiological processes usually out of balance with respect to their various rates. Thus a given symptom may follow more than one original cause. The manner of expression of deficiency by symptoms is also subject to modifications by environmental conditions;

as a result the same deficiency in a given crop may induce different symptoms in different geographical regions.

Carbon dioxide prevents the rapid increase in the reducing sugar content of potato tubers stored at low temperatures, F. E. DENNY and N. C. THORNTON (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 79-84).—The rapid increase in reducing sugar ordinarily occurring in potato tubers stored at 5° C. was prevented by storage in a 5 percent CO₂ atmosphere. After 2 mo. at 5° the reducing sugar content of the CO₂-treated lot was about one-fifth that of a control lot in air.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 42 (1941), No. 2, pp. 283-295).—The following are of botanical interest: A Possible Source of Gross Error in the Nephelometric Estimation of Bacterial Numbers, by P. L. Gainey (p. 285) (Kans. State Col.); Utilization of Histamine in Synthetic Media by Certain Members of the Genus *Pseudomonas*, by K. H. Lewis and D. I. Cook (p. 287) (Univ. Nebr.); Bacterial Utilization of Pure Fats and Their Components, by H. J. Peppler (pp. 288-289) (Kans. State Col.); and A Chemical Method for the Sterilization of Pectin, by D. B. McFadden (pp. 289-290) (Univ. Ky.).

Radioactive carbon as an indicator of carbon dioxide utilization.—V. Studies on the propionic acid bacteria, S. F. CARSON, J. W. FOSTER, S. RUBEN, and H. A. BARKER. (Univ. Calif. et al.). (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 5, pp. 229-235).

Actinomyces antibioticus, a new soil organism antagonistic to pathogenic and non-pathogenic bacteria, S. A. WAKSMAN and H. B. WOODBUFF. (N. J. Expt. Stas.). (*Jour. Bact.*, 42 (1941), No. 2, pp. 231-249, figs. 3).—An active substance was isolated from cultures of this organism and separated into two fractions designated actinomycin A and B. The first proved highly bacteriostatic, whereas the second had little such action but was often strongly bactericidal. Actinomycin A was found to possess bacteriostatic properties against all bacteria tested. Both substances prevented the development of *Azotobacter* at 1:1,000,000 concentration, and inhibited N fixation by it in culture media. Fungi were also sensitive to actinomycin. When added to agar media for plating natural materials, such as milk, soil, and sewage, actinomycin exerted a highly selective action on the different organisms contained therein. It is suggested that this selective effect offers interesting possibilities for demonstrating the presence of, and for isolating specific bacteria belonging to, gram-negative groups by the use of this substance.

The morphology and cytology of *Myxococcus xanthus* n. sp., J. M. BEEBE. (Iowa Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 2, pp. 193-223, figs. 28).—A general study of this member of the Myxobacteriales found growing on dry cow dung in a pasture. It was found to have a rather complex life history, and evidence is presented supporting the theory of a compact or condensed nucleus.

Sulfur and trace-element nutrition of *Aspergillus niger*, R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 2, pp. 109-127).—Alterations in the sulfur supply source were practically without effect on the trace-element requirements of *A. niger*, and Fe, Zn, Cu, Mn, Mo, and Ga were apparently required in about equal degree, whatever the state of oxidation of S supplied as a nutrient. The slightly better results obtained by omitting Cu with sodium hydroxymethane sulfinate, Mn with methionine, and Mo and Ga with cysteic acid may prove to have been due to chance. A survey of the assimilability of inorganic S compounds indicated that S is reduced to sulfoxylate prior to its conversion to organic S. Sulfide and disulfide were not assimilated. Assimilability of organic S varied with molecular configuration and was

also correlated with the presence of attached or adjacent O₂ in the molecule. Alkyl mercaptans, sulfides, and disulfides could not be used as S sources, whereas alkyl sulfonate and alkyl sulfinate were readily available. Utilization of S in alkyl sulfonates and alkyl sulfimates was considered to depend on their decomposition into free sulfinic acid and an unsaturated residue. Anabolites, particularly cystine and its derivatives, homocystine, and methionine, were readily available as sole S sources, irrespective of the state of oxidation of their contained S, and were assumed to follow the normal channel for their metabolism. Catabolites and miscellaneous synthetic organic S compounds were assumed to require a process of digestion before assimilation.

Some factors affecting the dry weight of *Chlorella vulgaris*, V. G. LILLY and L. H. LEONIAN. (W. Va. Expt. Sta.). (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 569-572).—As measured by dry weight of cells, indole-3-acetic and phenylacetic acids failed to increase *C. vulgaris* growth. Dextrose in the medium increased the yield of dry cells per culture from 3 mg. to 19 mg., and 1,000 p. p. m. of malic acid added to the dextrose increased it to 38 mg., whereas in the absence of dextrose it induced not more than 5 mg. It is believed that the alga breaks down the KNO₃ of the medium into ammonia, and by combining it with the hydroxyl radical of malic acid synthesizes aspartic acid. Since this amino acid is a more favorable source of N, the alga grows much more rapidly.

GENETICS

Cytology, genetics, and evolution, M. DEMEREC, C. W. METZ, F. SCHRADER, A. F. BLAKESLEE, T. DOBZHANSKY, C. E. McCLUNG, H. S. JENNINGS, W. F. DILLER, T. M. SONNEBORN, L. CHURNEY, W. R. DURYEE, and P. S. HENSHAW (*Philadelphia: Univ. Pa. Press, 1941, pp. V+168, pls. 4, figs. 17*).—Papers are presented on the fundamentals of cytology and their application to genetics and evolution.

The physiology of the gene, S. WRIGHT (*Physiol. Rev.*, 21 (1941), No. 3, pp. 487-527, figs. 10).—A review and discussion is given of the relation of gene reactions and interactions in a wide variety of plants and animals, including, especially, quantitative interpretations of multiple allelic series in guinea pigs and their effectiveness in controlling melanin production. Genic control of extra-organic structures is considered especially complex. There are included 274 references to the literature.

A summary of linkage studies in barley, D. W. ROBERTSON, G. A. WIEBE, and F. R. IMMER. (Colo. and Minn. Expt. Stas. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 47-64).—Results of numerous linkage studies in barley are summarized in tables of genetic factors, linkages and associations, factor pairs showing independent inheritance, and polysomics and polyploids. The method of assigning symbols used by corn geneticists and summarized by Emerson et al. (*E. S. R.*, 74, p. 323) was used as a basis in order to unify the nomenclature and symbols. The list of references includes 68 titles.

Inheritance of a melaninlike pigment in the glumes and caryopses of barley, R. W. WOODWARD. (U. S. D. A. coop. Utah Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 1, pp. 21-28, fig. 1).—A study of more than 100 varieties and strains of barley revealed no mutation or new off-color type although in some varieties individual plants segregated for two color classes. Barley varieties were grouped into five color classes, dense black, black, medium black, gray, and white, based upon the intensity of the black melaninlike pigment in the glume and pericarp. More than 50 crosses involving all group combinations were made and were studied in segregating generations. Eliminating the

black group, all crosses among the remaining four groups yielded monofactorial segregations in F_2 . The data suggested an allelomorphous series of factors causing various color-intensity expressions. Factors definitely established are black (BB), gray (B^gB^g), and white (bb). The denser color was always completely dominant over the lighter one. Attempts were made to isolate other color groups from the progeny of certain crosses, but only parental types were recovered in the homozygous condition in later generations. Pigment formation in both pericarp and flowering glume appeared to be controlled by a single series of allelomorphous genes.

The inheritance of rachilla length in barley, G. D. H. BELL and G. P. GARSON (*Jour. Agr. Sci. [England]*, 31 (1941), No. 2, pp. 246-279, figs. 18).—Rachilla length is affected as a varietal character by density of spike and type of hairs or bristles borne on the rachilla, and also is affected by environmental factors. In six-row barleys, the rachilla of the lateral spikelet is longer than that of the corresponding median spikelet. In the absence of complicating factors, rachilla length is inherited as a quantitative character with an intermediate F_1 and no visible segregation in F_2 . Four major factors appear to be involved when extremes of length are crossed. Crossing of Archer and Chevalier type parents gave dominance of length and a possible heterotic effect. Long rachilla appeared to be linked with the Chevalier type of rachilla.

Relation between yielding ability and homozygosis in barley crosses, F. R. IMMER. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 200-206).—The amount of heterosis in F_1 crosses between six varieties of barley and the reduction in yield during successive generations of natural selfing in the same crosses was studied, 1938-40. As an average of all crosses the F_1 exceeded the average of the parents by 8.3 percent in number of heads per plant, 11.1 in number of seeds per head, 4.9 in weight per seed, and 27.3 percent in yield per plant. The average yield of the six crosses in F_2 and F_3 in replicated trials, as an average of 2 yr., exceeded the parental average by 24 and 13 percent, respectively. A suggestion is made that the yield performance of different crosses may be determined by replicated yield trials in the F_2 or F_3 , and that such tests be used for discarding the poorest crosses and selection limited to high-yielding crosses, since the proportion of high-yielding genotypes in the low-yielding crosses will be less than in crosses with a higher average yield.

The segregation of genes affecting yield prepotency, lodging, and disease resistance in F_2 and F_4 lines of corn, G. F. SPRAGUE and A. A. BRYAN. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 207-214, fig. 1).—After 73 F_2 lines from the single-cross L 317 \times B₁ 345 corn were top-crossed by Krug and tested for yield, lodging, and damaged kernels in 1934 and 1935, 12 F_3 families were chosen for further study on the basis of top-cross performance, and five F_4 ears were chosen to represent each F_3 family. The F_4 lines were top-crossed by the synthetic hybrid 8037 and tested for yield trials, 1938-39. Significant segregations were found to occur among the F_4 lines for yield prepotency, lodging, and disease resistance. Bearings of these results on early and late testing of inbred lines are discussed.

Different rates of crossing over in male and female gametes of maize, M. M. RHOADES (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 603-615).—Crossing over was studied in the A_2 - Bt and A_2 - Bm regions which lie in the short arm of chromosome 5 of corn, and in the Bt - Pr and Bm - Pr which lie in the long arm. Bt and Bm loci were used to mark the centromere since they lie in opposite arms and are linked very closely. The exact direct and reciprocal backcrosses made gave a total population of about 33,000. Frequency of crossing over in male flowers for the four regions studied was significantly higher than in female

flowers, an inequality in contrast to previous results of corn investigators studying regions different from these. The suggestion made is that only those regions adjacent to the centromere will show a crossover difference associated with sex. Results of three-point tests where the two regions lay in opposite arms showed that interference does not extend across the centromere.

The stability of broken ends of chromosomes in *Zea mays*, B. McCLINTOCK. (Univ. Mo.). (*Genetics*, 26 (1941), No. 2, pp. 234-282, figs. 15).—The use of a number of structural modifications of chromosome 9 of corn made it possible to produce dicentric chromatids at meiosis following crossing over. Rupture of the dicentric chromatids at meiotic anaphases often produced chromatids with a broken end yet having a complete complement of genes. During the following gametophytic division, fusions at the position of breakage between the two sister halves of the broken chromatid resulted in an anaphase bridge configuration. Rupture of this bridge at late anaphase or early telophase again introduced a broken chromosome into the sister telophase nuclei. There was evidence that the breakage-fusion-ridge cycle continues in successive nuclear divisions of the gametophyte and in nuclear divisions of the endosperm which follows. When such a broken chromosome is introduced into the zygote, the broken end heals, discontinuing the breakage-fusion-ridge cycle. The healed broken end behaves in every respect like a normal end in successive nuclear divisions in the sporophytic tissues and in all nuclear divisions of succeeding gametophytic, endosperm, and sporophytic generations.

Genetic studies of reactions to smut and of firing in maize by means of chromosomal translocations, L. C. SABOE and H. K. HAYES. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 463-470).—F₁ crosses between smut-susceptible interchange lines and two resistant inbred lines derived from Rustler and Minnesota No. 13 were backcrossed to the resistant inbred parents. Linkage relations between the point of interchange and smut reaction were studied in the backcross progeny. Plants heterozygous for an interchange showed sterility in one-half of the pollen grains and ovules. In the Minnesota No. 13 crosses indications were that at least three factor pairs or linked groups of factors were responsible for the smut reaction, while in the Rustler crosses at least two or possibly three factor pairs or linked groups of factors were involved. The location of factors for smut resistance was different in the two inbreds. At least three factor pairs or linked groups of factors seemed responsible for the firing character studied similarly in the Rustler smut-resistant inbred lines.

Stomatal behavior in inbred and hybrid maize, D. G. CLARK, H. HECHT, O. F. CURTIS, and J. I. SHAFER, JR. (Cornell Univ.). (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 537-541).—Stomates of the high-yielding varieties of corn studied opened earlier in the morning and remained open later in the afternoon than did those of the low-yielding varieties. Except for one case, this was correlated with increases in dry matter of the plants involved. Reciprocal crosses showed no difference in stomatal behavior.

Correlated studies of winterhardiness and rust reaction of parents and inbred progenies of orchard grass and timothy, W. M. MYERS and S. J. P. CHILTON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 215-220, figs. 2).—Significant differences in winter injury were found among 59 parental clones of orchard grass and among 60 parental clones of timothy. Correlation coefficients of mean winter injury of parental clones and their inbred progenies were 0.905 and 0.849, respectively, in orchard grass and timothy. Segregation within inbred progenies suggested the possibility of selecting for resistance to winter injury both within and between inbred progenies. Severity of stem rust infection in the preceding summer was correlated with degree of winter injury in parental clones of timothy, but not in orchard grass.

A cytological study of California forage grasses, G. L. STEBBINS, JR., and R. M. LOVE. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 5, pp. 371-382, figs. 39).—A preliminary cytological survey mainly of forage grasses characteristic of valley and foothill ranges of California, and some forms from higher altitudes and species not found on the ranges themselves, gives chromosome numbers of 58 species of Gramineae, belonging to 19 genera. Intraspecific polyploidy was found in California representatives of *Poa scabrella*, *Elymus triticoides*, *E. condensatus*, and *Hordeum nodosum*, while comparison with counts obtained by workers in other regions indicates the presence of such series in *Bromus carinatus*, *P. epilis*, *Koeleria cristata*, and *Agrostis exarata*. Aneuploid intraspecific variation was found or indicated in *P. scabrella*, *P. secunda*, *P. nevadensis*, and *Stipa lemmoni*. The diploid number $2n=40$ was found for two species of *Distichlis*, indicating that the basic haploid number for this genus is $x=10$, as in the related genus *Aeluropus*. *Danthonia californica* and *D. unispicata* are both apparently hexaploids on the basis of $x=6$. An aneuploid series of numbers was found in *Stipa*, largely explained as derived from the basic numbers $x=6$ and $x=11$. In cytological and morphological relationships, *Distichlis* and *Danthonia* occupy critical positions in the family Gramineae. Facts now known about them are held to indicate weaknesses in accepted systems of classification of the family and in modifications proposed on the basis of cytological and histological evidence. Of the perennial species, the drier, hotter regions of California contain a relatively high proportion of polyploids, probably chiefly or entirely allopolyploids. The production of artificial allopolyploids from suitable crosses is indicated as a hopeful method of obtaining new drought-resistant forms.

Somatic doubling of chromosomes and nodular infection in certain Leguminosae, L. WIFF and D. C. COOPER. (Wis. Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 821-824, figs. 15).—Cells having the tetraploid number of chromosomes occasionally are present at the level of root-hair production in roots of *Pisum sativum*, *Lathyrus latifolius*, *L. odoratus*, *Lespedeza tomentosa*, and *Vicia villosa*. Such cells occur in the parenchyma of the cortex, usually near the endodermis and in the neighborhood of secondary root primordia. A definite relationship was apparent between normal occurrence of disomatic cells and formation of root nodules in pea and vetch. Wherever nodular stimulation occurs, one or more disomatic cells are found in the proliferating region of the cortex even though the infection thread has not yet penetrated that area. Later the rhizobia occupy only the disomatic cells. Many infection threads cause no stimulation whatever, even though they may penetrate several layers of the inner cortical cells. No disomatic cells were observed in the vicinity of such threads. The nuclei of the monosomatic (diploid) cells penetrated by the threads take a much deeper stain than do the nuclei of adjacent uninfected cells. The chromatic substance becomes diffuse, and the nucleus assumes an irregular shape.

Controlled self- and cross-pollination of *Trifolium repens*, S. S. ATWOOD. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 538-545).—Methods described have been found most satisfactory for growing white clover in the greenhouse to obtain an abundance of flowers for controlled pollinations. Suction emasculation has been adapted to white clover (with certain modifications) to yield satisfactory results. When plants differing in degree of pseudo-self-compatibility, all with recessive solid green leaves, were crossed as females, using three methods, with a plant homozygous for a dominant leaf marking, accidental self-pollinations occurred only rarely. Emasculation is performed primarily to allow an easier and more certain application of the pollen. Seed yields obtained on pseudo-self-compatible plants under bag in the field were approximated more closely in the greenhouse by rubbing entire heads than by pollination of 10

flowers per head with a toothpick. When five compatible and four incompatible crosses were made with bee pollination under field cages, differences between crosses and between plants in number of seeds set resembled those obtained by hand-pollination in the greenhouse. Similarly, differences in seed-set between seven self-pollinations made by bees under cages were confirmed under bag in the field. Rubbing entire heads in the field without removing the enclosing muslin bags is needed for self-pollination of most plants. Three manipulations every other day after bagging resulted in as many seeds as with manipulation every day for 6 days.

The regularity of meiosis in microsporocytes of *Trifolium repens*, S. S. ATWOOD and H. D. HILL. (U. S. D. A.). (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 730-735, figs. 15).—Observations on preparations from 11 plants of white clover revealed 16 bivalent in each of 605 microsporocytes, in which the chromosomes were counted in diakinesis or heterotypic metaphase. One cell had 15 bivalents and 2 univalents, and four others seemed to show either precocious disjunction or irregular pairing of one pair. Polyvalent pairing was not observed. Frequency of chiasma observed in side views of heterotypic metaphase averaged 16.7 per cell. Sixteen chromosome were seen in each of 906 chromosome groups counted at heterotypic anaphase or homeotypic metaphase. One other cell had a 15 to 17 distribution, and two others had all 32 chromosomes in a single group. All 93 chromosome groups from 60 sporocytes counted at homeotypic anaphase had 16 chromosomes. The chromosome number in root tips of more than 100 plants was 32. White clover probably is an amphidiploid, rather than an autotetraploid, and should show disomic inheritance.

Self-fertility in red clover in Minnesota, E. H. RINKE and I. J. JOHNSON. (*Minn. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 512-521).—A self-fertile line of red clover which appeared in the fifth generation of a self-pollinated line and continued to be highly self-fertile in 10 subsequent generations of self-pollination was homozygous for nonmarking of leaf and much less vigorous than commercial red clover. Seed setting was studied in the F_1 and F_2 of crosses between this line and commercial red clover. Self-fertility appeared to be dominant in the F_1 . Two of 182 F_2 plants seemed definitely self-sterile, 5 gave very low seed production under self-pollination and may have been pseudo-self-fertile, and the remainder evidently carried the factor for self-fertility. Leaf-marking was dominant in the F_1 over nonmarking, and F_2 segregation was on a 3 : 1 basis. The self-fertile line flowers much later than, and the F_1 as early as, the commercial variety. About 85 percent of the F_2 plants flowered earlier than the late variety. The suggestion is made and methods are outlined for the production of inbred plants carrying different self-sterility alleles and the gene for self-fertility, and for elimination of the fertility gene after its use as a means of selection in self-pollinated lines.

A study of methods of breeding orchard grass, *Dactylis glomerata* L., H. K. SCHULTZ. (*Minn. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 546-558).—Studies were made of the winterhardiness of naturalized and introduced strains of orchard grass, effects of self-fertilization, and genotypic variability of important characters. Eighteen selected strains and many selfed lines from a single collection differed widely in winter survival. Winterhardy plants tended to produce winterhardy selfed progenies, but winterhardiness in the field was not correlated with cold resistance in the freezing chamber. A wide range of self-fertility was found between and within selfed progenies and between open-pollinated plants from eight collections of strains, and the amount of selfed seed varied from year to year. Reaction to stem rust (*Puccinia graminis avenae*) varied from complete resistance to extreme susceptibility

in all open-pollinated strains studied. Uniformly resistant 2-yr. selfed lines were obtained, and, under a leaf spot epidemic, uniformly leaf-spot-resistant selfed progenies were found. Means for yield, plant height, and number of culms of 1- and 2-yr. selfed progenies were progressively lower than parental means for the same characters. Significant differences were found in a group of selected 2-yr. selfed plants, within an open-pollinated group, and between the two groups for every agronomic character studied. A number of vigorous clones, found in the 2-yr. selfed group, were equal to superior individuals in the open-pollinated group. Significant correlations included plant type, plant height, and number of culms of parent plants positively with means for these same characters of their clonal progenies grown in the next year; yield positively with winterhardiness, plant height, and number of culms in the first crop, and yield negatively with erect plant type, percentage rust infection, and number of culms in the second crop. Two new potentially promising strains made by mass pollination of superior selections from 1- and 2-yr. selfed and open-pollinated plants from northern sources were being tested extensively in 1941.

Interspecific genetic relationships in *Lactuca*, R. C. THOMPSON, T. W. WHITAKER, and W. F. KOSAR. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 2, pp. 91-107, figs. 3).—A large number of species of lettuce were tested for resistance to aster yellows virus and other diseases and were crossed to determine possibilities in combination. In 81 attempted interspecific crosses, 29 were successful in producing viable embryos and hybrid seedlings. Eleven of the successful crosses proved self-fertile or partly so, and the other 18 yielded either weak, abnormal seedlings unable to survive beyond the infantile or rosette stage, or strong, vigorous plants that developed more or less normally but were completely self-sterile. Of twelve 9-chromosome species, *L. indica*, *L. laciniata*, *L. tatarica*, and *L. raddeana* were found capable of crossing among themselves, but, except in the case of *L. indica* × *L. laciniata* and *L. raddeana* × *L. indica*, the hybrids were self-sterile. The 9-chromosome species *L. sativa*, *L. serriola*, *L. altaica*, *L. saligna*, and *L. virosa* were found capable of intercrossing, with some hybrids as fertile as either parent and others completely self-sterile. Attempts to cross species from the above two groups were fruitless. All of the four 17-chromosome species, namely, *L. canadensis*, *L. spicata*, *L. floridana*, and *L. graminifolia*, were apparently closely related and were found capable of intercrossing. Some of the crosses proved fertile, or partially so. In 16 crosses between 17- and 9-chromosome species, all but 2 of which involved 9-chromosome species of the *L. indica* group, fertilized embryos were obtained. All crosses between 17-chromosome species and 9-chromosome species of the *L. serriola* group failed with one exception, that of *L. graminifolia* × *L. virosa*. The discouraging feature was the apparent incompatibility of *L. sativa*, cultivated lettuce, with most of the other species. Hybridization appeared possible only with *L. serriola*, and some other closely related forms. Unfortunately, most of the promising material for resistance lay in species remotely related to *L. sativa*.

Inheritance studies on duration of developmental stages in crosses within the genus *Lycopersicon*, L. POWERS and C. B. LYON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 3, pp. 129-148).—The division of the period from seeding to first complete change of color of any fruit into the following stages of development was found to be biologically sound for certain crosses involving varieties of *L. esculentum* and *L. pimpinellifolium*: (1) Number of days from seeding to first bloom, (2) number of days from first bloom to first fruit set, and (3) number of days from first fruit set to first complete change of color of any fruit. In each stage of development heterosis was exhibited in some one or other of the crosses and was found to be dependent upon both the

genotype (cross) and the environment. The method involving comparison of the obtained mean of a given generation with predicted arithmetic and geometric means calculated from obtained parental and F_1 means was of little value, as regards these data, in determining whether the nature of the interactions of the genes was such that the effects were arithmetically cumulative or whether it was such that the effects were geometrically cumulative. The possible importance of the findings in a plant-breeding program is discussed.

Inheritance of stages of earliness in an interspecific cross between *Lycopersicon esculentum* and *L. pimpinellifolium*, C. B. LYON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 3, pp. 175-182).—In a study of a population of 5,760 tomato plants, which included both parental species, the F_1 generation, and advanced generations, it was not possible in any stage of earliness to demonstrate arithmetically cumulative genic effects. In four of the five constituent stages, it was possible to show that the effects of the genes were geometrically cumulative and that dominance as exhibited by the F_1 generation must be taken into account.

Inheritance of quantitative characters in crosses involving two species of *Lycopersicon*, L. POWERS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 3, pp. 149-174).—The studies here reported included as parental material Bonny Best, Danmark, and Johannisfeuer varieties of *L. esculentum* and the Red Currant variety of *L. pimpinellifolium*. The genetic study included each parent, the F_1 and F_2 generations, and the generations obtained from backcrossing to each parent. Small size of tomato fruit as determined by weight was found to be partially dominant. Small number of locules was found to be either completely or partially dominant. Partial dominance or heterosis was exhibited for smaller number of fruits per unit length of branch. Heterosis obtained for increased height and spread of plant. The increase in plant size and the previously determined earliness, due to heterosis, are deemed sufficient to warrant an intensive study of the possibility of utilizing this phenomenon in the commercial production of tomatoes. Evidence is presented to show that from the standpoint of physiological genetics heterosis and dominance are merely different degrees of the same phenomena.

[**Studies in inheritance with livestock by the Texas Station**]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1940*, pp. 37-40).—Reports by B. L. Warwick, J. M. Jones, W. H. Dameron, P. B. Dunkle, J. C. Miller, S. P. Davis, R. O. Berry, H. C. McPhee, and D. A. Spencer deal with investigations on inheritance in sheep and goats and interspecific crosses of factors for hornlessness, fineness of fiber, cryptorchidism, and tail length; type in Angora goats; and skin folds on Rambouillet sheep.

Achondroplasia in calves, G. W. BRANDT. (Ohio State Univ.). (*Jour. Hered.*, 32 (1941), No. 6, pp. 183-186, fig. 1).—Two cases of achondroplasia in calves thought to be of the recessive type, described by Hutt (E. S. R., 71, p. 307), are noted.

[**Development of the Targhee sheep at the Western Sheep Breeding Laboratory**] (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 3, p. 7, fig. 1).—The Targhee breed has been produced from crossing Lincoln rams on Rambouillet ewes and backcrossing to Rambouillets. In the development of the breed, Corriedale blood was introduced.

Studies on hereditary dwarfism in mice, III, IV (*Acta Pathol. et Microbiol. Scand.*, 18 (1941), Nos. 1, pp. 20-35, figs. 11; 2, pp. 169-185, figs. 3).—Two papers are presented in continuation of this series by T. Kemp and L. Marx:³

³ *Acta Pathol. et Microbiol. Scand.*, 14 (1937), No. 2, pp. 197-227, figs. 20.

III. *Development of the adrenals in dwarf mice*, E. D. Bartels.—A review of the histological structure in normal and dwarf mice is presented.

IV. *On the function of metabolic active hormones in the anterior pituitary dwarf mouse*, C. J. Møllenbach.—Histological examination of the fat and the glycogen in the liver cells of dwarfs and normals after feeding and fasting showed that fat deposits in the dwarfs were scanty, whereas the glycogen was present in very abundant amounts although it was broken down and assimilated irregularly. It was assumed that the lack of eosinophile cells in the anterior lobe of the pituitary caused hyposecretion of one or more metabolically active hormones.

Relative growth in Bantams and Leghorns, I. M. LERNER. (Univ. Calif.). (*Growth*, 5 (1941), No. 1, pp. 1-9).—A statistical study of the relative growth of long bones in Bantams and Leghorns and crosses between them showed the constants of heterauxesis to be of the same magnitude. The limiting equilibrium constants for bone length were lower in the Bantams than the actual equilibrium constants.

Genetic resistance to a transmissible sarcoma in the fowl, R. K. COLE. (Cornell Univ.). (*Cancer Res.*, 1 (1941), No. 9, pp. 714-720, fig. 1).—Two lines of Single-Comb White Leghorns were differentiated on the basis of susceptibility to a certain type of sarcoma. Although 64.2 percent of the chicks were susceptible at the start of the experiment, lines with 77.2 and 12.5 percent susceptibility were developed by selection based on progeny performance for four and three generations, respectively. Susceptibility did not appear to be influenced by age or sex. Resistance to the sarcoma was not indicative of resistance to common causes of poultry mortality.

Pictorial representation of the antigenic differences between two dove species, R. W. CUMLEY and M. R. IRWIN. (Wis. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 6, pp. 179-182, figs. 3).—A diagrammatic presentation is given of the relationship of antibodies in the Pearlneck and ringdove breeds, in which each species has one specific antigen and both contain a common antigen.

Estrus, ovulation, and related phenomena in the mare, F. N. ANDREWS and F. F. MCKENZIE. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul.* 329 (1941), pp. 117, figs. 60).—Observations of oestrus, ovulation, and related phenomena were made on 42 purebred and grade Belgian, 2 grade Percheron, 1 grade Shire, and 35 grade Thoroughbred mares at the U. S. Range Livestock Experiment Station, Miles City, Mont., during the breeding seasons of 1937 and 1938. The responses of the mares in teasing stalls gave opportunity to study the duration of oestrus and differences in the psychological responses at different stages of the cycle. However, sexual behavior tended to be masked until the mares became accustomed to the teasing procedure. The average duration of the oestrous periods was 5.3 days, ranging from 1 to 37 days. "Split" oestrus and "physiological" oestrus, in which follicles were produced and ruptured and the vagina and cervix underwent changes characteristic of oestrus but the ♀s expressed no desire to mate, were observed. The mean period between parturition and heat averaged 11.4 days. There was no relation of size of follicles, as determined by rectal palpation, to sex desire. Follicles ranged from 1 to 7.5 cm. in diameter during oestrus, with about half of them averaging 4 cm. on the day prior to the detection of a corpus luteum. Ovulation was not dependent on oestrus nor oestrus upon ovulation, but in 76.7 percent of the cases a corpus luteum was detected from 1 day before to 1 day after termination of heat. Following artificial rupture of follicles, heat was terminated in from 1 to 3 days. Examination of the physiological changes in the genital tract of representative mares showed much

variation, but the secretions of the vagina and cervix were most abundant but least viscous during oestrus. It was also noted that rectal and vaginal temperatures were usually slightly higher in oestrus and lactation than during the interoestrous period and in dry mares, respectively. Histological study of the genital tract and vaginal smears from samples of the vaginas and uteri removed by biopsy showed variations in the number of leucocytes and cornified and nucleated epithelial cells which were associated with stages of the oestrous cycle. In natural breeding, 69 percent of the mares conceived, with an average of 7.6 services per pregnancy. Lactation, split oestrus, and physiological oestrus did not appear to interfere with conception. Only 50 percent of the mares bred during the foal heat and 42.1 percent of the maiden mares conceived.

Ovulation induced in mice by single injections of Follutein or untreated human pregnancy urine, H. O. BURDICK and R. WHITNEY (*Amer. Jour. Physiol.*, 132 (1941), No. 2, pp. 405-410, figs. 2).—Single subcutaneous injections of 0.5 cc. of untreated pregnancy urine induced ovulation in ♀ mice within 15 hr., but immature ♀s weighing less than 13 gm. failed to ovulate. Similar results were obtained on injection of mature ♀s with 200 or 300 rat units of Follutein. Evidently, 200 rat units were as effective in causing ovulation as larger doses. It appears that ovulation may occur in from 10 to 15 hr. after injection. Autopsy of mature ♀s 14 hr. after injection showed ova with granulosa cells generally to be present. The study was based on autopsies of 41 treated ♀s.

The response of the gonads of chick embryos to gonadogen, W. G. VENZKE. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 4, pp. 281-284, figs. 8).—Injection of 324 Single-Comb White Leghorn eggs with single and repeated doses of 0.5 to 1 cc. of gonadogen (pregnant-mare serum) containing 5 to 30 units resulted in the development of enlarged gonads in the embryos of both sexes as compared with the controls. Hyperplasia occurred in the germinal tissues and in the secondary sex glands. No responses were observed in the head furnishings of the embryos at 20 days of incubation.

FIELD CROPS

[Field crops research by the Georgia Coastal Plain Station, 1939]. (Partly coop. Ga. Expt. Sta., U. S. D. A., Univ. Ga., et al.). (*Georgia Coastal Plain Sta. Bul.* 31 (1940), pp. 14-29, 30-39, 79-83, 123-130, 138-143, 145-146).—Experiments with field crops reported on (E. S. R., 83, p. 616) for 1939 and for different periods of years included variety tests with cotton, corn for yield and resistance to weevils, oats, wheat, rye, grain sorghum, sorgo, peanuts, soybeans for seed and forage, cowpeas, velvetbeans, crotalaria, winter cover crops, pasture grasses, and miscellaneous summer forage crops; breeding work with corn, cotton, oats, peanuts, tobacco, and pasture grasses; winter cover and green manure crops for cotton and corn; cultural (including planting) experiments with corn, oats, wheat, peanuts, tobacco, and winter cover crops; and development of sea-island cotton production. Fertilizer experiments included formulas and carriers of N, P, and K with cotton and sweetpotatoes, and also fertilizer placement for cotton and tobacco; nitrogen and potassium top dressings for cotton and sweetpotatoes; secondary nutrient elements for cotton and tobacco; K and S relation, B, plant bed fertilizer, and acid, basic, and neutral fertilizer tests with tobacco; ratios of organic : nonorganic N with sweetpotatoes; and experiments with corn, oats, and peanuts, mainly formulas and rates of application. Recommendations on soils, varieties, plant beds, fertilizers, spacing and topping, and curing for flue-cured tobacco are again included. Besides the work with flue-cured tobacco noted above, progress reports are also made from studies with cigar-wrapper tobacco at the Shade Tobacco Substation near Attapulgus, Ga., including fertilizer for-

mulas, with variations in N, P, K, Ca, Mg, S, B, and Cl, varying ratios of nutrients and of N carriers, rates of stable manure, and organic N and P carriers; fertilizer placement; and seed production.

[Field crops investigations in Texas]. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1940*, pp. 26, 29-32, 60-83, 114-115, 119, 139-143, 144-146, 150-153, 154-155, 160-162, 164-166, 170, 175-182, 184-193, 194-195, 198, 199, 200, 203-207, 208, 210-212, 218-219, 223, 224, 224-229, 230-231, 232, 233, 239-243, 251-253, 253-254, 256-258, 261-264, 270).—Research with field crops and related lines (E. S. R., 84, p. 752) at the station and substations, is reported on briefly by W. H. Friend, J. F. Wood, E. S. McFadden, E. B. Reynolds, R. H. Stansel, P. R. Johnson, H. F. Morris, D. T. Killough, T. R. Richmond, R. E. Harper, J. E. Roberts, R. H. Wyche, H. M. Beachell, R. E. Dickson, C. E. Fisher, P. C. Mangelsdorf, J. S. Rogers, H. P. Smith, D. L. Jones, M. H. Byrom, G. S. Fraps, R. L. Hensel, J. H. Jones, G. C. Warner, D. A. Reid, J. O. Beasley, K. F. Manke, H. E. Rea, R. E. Karper, J. R. Quinby, R. G. Reeves, M. A. Grimes, H. B. Parks, A. H. Alex, C. E. Minarik, E. Mortensen, C. Riecker, R. L. Lee, Jr., E. C. Tullis, H. O. Hill, C. H. Rogers, I. M. Atkins, P. B. Dunkle, F. Gaines, E. K. Crouch, J. C. Stephens, W. H. Dameron, V. L. Cory, W. H. Friend, and L. E. Brooks.

The studies included varietal tests with cotton, corn (and corn hybrids), wheat, oats, barley, rye, rice, grain sorghum, sorgo, broomcorn, flax, soybeans, alfalfa, clover, sweetclover, potatoes, sweetpotatoes, castor-beans, and miscellaneous winter and summer legumes and grasses; winterhardiness tests with varieties of oats and sweetclover; production tests with safflower, spineless cactus, and teosinte; flax as a winter crop for south Texas; breeding work with cotton, wheat, oats, barley, corn, sweet corn, rice, grain sorghum, sorgo, flax, sweetpotatoes, Sudan grass, soybeans, cowpeas, peanuts, and buffalo, Angleton, and other grasses; development of cotton varieties adapted to mechanical harvesting; cytogenetics of cotton; inheritance studies with cotton, corn, wheat, and different sorghums; studies of the genetic and cytological relationships of corn, *Euchlaena*, and *Tripsacum*; hybrid vigor in sorghum; cultural (including planting) tests with cotton, corn, wheat, rice, grain sorghum, buffalo grass, flax, soybeans, sweetclover, and winter legumes; a variety-spacing test with corn; size of seed, height of bed, date of planting, spacing, rooted v. cut slips, cover crop, and harvesting tests with sweetpotatoes; effects of different plant spacings upon cotton yield and fiber length and on poor, medium, and fertile soils; physical characteristics in cotton lint and their interrelations; root initiation by seedlings from cottonseed treated with growth-promoting substances; seedbed preparation studies; comparisons of corn and sorghums and their effects on succeeding crops; double cropping experiments with sorghum to determine possibilities of growing two crops of grain from early varieties; effect of light and length of day on maturity of sorghums; forage yields of corn, sunflower and sorghum varieties; irrigation tests with cotton, grain sorghum, corn, alfalfa, and sugar beets; rotation and sequence experiments with different field crops and green manures; effect of different amounts of sorghum stubble or stalk on yield of oats; fertilizer tests with crops in rotation, corn, oats, rice, potatoes, sweetpotatoes, grain sorghum, sugarcane, alfalfa, pasture, and cotton; methods of applying fertilizers and carriers of nitrogen, phosphorus, sulfur, and vitamin B₁ for rice; tolerance of rice to different soil reactions and hydrogen sulfide; nitrogen and potash carriers, cotton burs v. manure and the value of Mn and B, all for cotton; hairy vetch and other green manures for cotton and other crops; inoculation studies with soybeans and with legumes for green manure; soil fertility and improvement studies; canaigre for tannin; rotation

grazing and pulling in control of bitterweed; control of mesquite and pasture weeds; production and germination of buffalo grass seed; and establishment of buffalo grass pasture.

Other pasture improvement and management investigations were concerned with plants and seeds mixtures for different types of pasture, effects of fertilizer treatments on yield and chemical and botanical composition of herbage, relation of sunlight to the yield and quality of vegetation, introduction of new grasses and legumes and sods for observation, temporary pasture studies, grazing tests with Sudan grass strains and new grasses, comparison of Sudan grass (in rows) with buffalo grass turf on dry land and under irrigation, effects of fertilizers on production of carpet grass pastures and on establishment and survival of clovers on native pasture, and vegetation counts on ranges.

Revegetation of abandoned fields in Kansas and Oklahoma, W. E. BOOTH. (Univ. Kans.). (*Amer. Jour. Bot.*, 28 (1941), No. 5, pp. 415-422, figs. 3).—A field survey accompanied by a botanical analysis showed that the sequence of the stages of plant succession on abandoned cropland in southern Kansas and central Oklahoma was weed, annual grass, perennial bunchgrass, and fully developed prairie. Under favorable conditions the weed stage lasts for 2 yr., the annual grass 9 to 13 yr., and the bunchgrass for an undetermined period. The oldest abandoned field examined in this stage, 30 yr. old, did not appear to be nearing the fully developed prairie stage. The period that fields remain in a stage of low forage production depends upon the treatment of the land. Certain cultural methods may greatly hasten plant succession, while excessive grazing and burning may prevent the development of desirable vegetation. During the plant succession process further erosion is negligible as a result of a well-developed microphyte (alga) cover which offsets inadequacies of partial cover formed by seed plants.

Seasonal growth of grass roots, I. H. STUCKEY. (R. I. Expt. Sta.). (*Amer. Jour. Bot.*, 28 (1941), No. 6, pp. 486-491).—Observations on the seasonal development on unclipped plants of 12 species of grasses, 1939-40, revealed that for timothy, timothy S-50, meadow fescue, rough-stalked meadowgrass, perennial ryegrass, probably Colonial bent, and redtop, the whole root system was regenerated annually, with active production of new growth beginning in October, continuing slowly through the winter and increasing rapidly after the spring thaw in March, with its maximum in April. After June 15 few, if any, new roots were formed and no appreciable growth of existing roots occurred until October. Most old roots disintegrated shortly after new ones developed. With species having "perennial" roots, i. e., Kentucky and Canada bluegrasses, crested wheatgrass, and orchard grass, the development of the roots in the first year was similar to that described above, but only a small percentage of the roots disintegrated, and after the first spring few new ones developed. Most new roots developed during the second year were at the nodes of new rhizomes. If cell division is a fair criterion of growth, root tips were found dividing very close to 32° F. Cessation of root growth during summer coincided with periods of high soil temperatures. There was some indication that production of new roots may be inhibited by developing flower primordia.

Fertilizer distributor for factorial design experiments, P. H. WESSELS. (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 259-262, figs. 6).—The construction and operation of the apparatus are illustrated and described with remarks on its use in potato fertilizer experiments.

A satisfactory support for cereals growing in pots, J. W. TAYLOR and F. A. COFFMAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 264-265, fig. 1).—A single stake, made of No. 10 stiff steel galvanized wire 42 in. long, and

a movable wire loop for each pot proved very satisfactory for supporting cereal plants.

Vitamin B₁ (thiamin chloride) and the yield of corn and sorghum under field conditions, H. E. MYERS, R. W. JUGENHEIMER, and E. G. HEYNE. (Kans. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 474-476).—Treatments of hybrid corns (0.1 and 1 mg. per hill) and Blackhull kafir (0.1 mg. per plant) with vitamin B₁ did not affect yields of grain or stover of either crop significantly, nor were differences observed in tillering, lodging, plant height, or maturity. The results resembled those reported for other species of plants by several investigators.

Measurements of recovery after cutting and fall dormancy of varieties and strains of alfalfa, *Medicago sativa*, M. A. SPRAGUE and R. F. FUELLEMAN. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 437-447).—Methods were devised to evaluate numerically the rate of recovery following the first cutting and the degree of dormancy of the growth during the fall period following the second cutting in 8 alfalfa varieties, including 4 strains of Grimm, 4 of Common, 8 of Cossack, 29 of Ladak, and 1 strain each of Norwis, Turkistan, Hardistan, and Hardigan. Differences in recovery were most pronounced within 19 days after the first cutting, but differences in fall dormancy were noted throughout the fall growth period. Varieties slow to recover after the first cutting were usually those showing the greatest fall dormancy. Varietal ranking on the basis of increasing dormancy was Common, Grimm, Hardigan, Norwis, Cossack, Hardistan, Turkistan, and Ladak. Variations in summer recovery and fall dormancy between strains within a variety were greatest in Ladak, but such differences were not associated with the regional origin of the seed.

An association of smooth-awnedness and spring growth habit in barley strains, G. K. MIDDLETON and W. H. CHAPMAN. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 361-366).—Census studies on a barley composite hybrid (C. I. 5461) between the third and thirteenth generations showed that smooth-awned types have disappeared rapidly from the composite at Statesville and Swannanoa and hooded types at Statesville, N. C. Yields, 1937-39, of bulked segregates from this composite favored rough-awned forms over smooth-awned or hooded sorts. Yield trials with true-breeding lines from a single cross between rough- and smooth-awned strains also favored rough-awned types. An association, found between factors for spring growth habit and smooth awedness, is offered as a factor in the lack of adaptation generally observed in smooth-awned strains when fall-sown at these locations.

Barley varieties registered, VI, H. K. HAYES. (Univ. Minn.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 252-254).—Productive varieties of barley approved for registration since the previous report (E. S. R., 83, p. 49) included Wintex, a six-rowed, awned selection from Smith barley, intermediate in growth habit, and adapted to fall or spring seeding: Compana, an early two-rowed, hulled, semi-smooth-awned variety, selected from a composite cross, resistant to drought and grasshoppers; and Barbless, a lax, six-rowed, hulled, smooth-awned barley, resistant to stripe disease (produced from Oderbrucker × Lion) and grown extensively under the name of Wisconsin No. 38.

La yuca Brasil No. 1 [Brazil No. 1 cassava], J. MOLINARY SALÉS (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 2, pp. 8, 10, fig. 1).—Introduced from Brazil and under test by the station, Brazil No. 1 cassava is described as a productive variety desirable for flour and starch manufacture and for table use.

The effect of cyanamid and potash when plowed under with organic refuse on the yield of corn and succeeding crops, H. L. COOK and G. D. SCARSETH. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 283-293, fig. 1).—Corn planted after cyanamide and potassium chloride had been applied at several rates per acre with various crop residues plowed under on six soil types, supplementing 300 lb. of 0-16-4 fertilizer in the row, made acre increases in 17 tests, 1938-40, ranging from 5 to 10 bu. with 100 lb. of cyanamide, 8 to 20 bu. with 200 lb., and 14 to 40 bu. with 400 lb. Responses to additional K were greatest with the highest N levels. Considerable of the N and K applied remained in the soil for corn, wheat, oats, soybeans, following corn in the rotation. Costs of producing corn with the several treatments on Bedford and Clermont soils are tabulated and discussed.

A possible new method for the control of pollination of corn, A. N. HUME. (S. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 265-266, fig. 1).—The placing of muslin overall bags over corn plants before silking provided satisfactory controlled pollination in 75 percent of the hills covered in 1939 and gave encouraging results in 1940. The technic is illustrated and described.

Maize bibliography for the years 1917 to 1936, inclusive, J. C. CUNNINGHAM (*Contrib. Iowa Corn Res. Inst. [Iowa Sta.]*, 2 (1941), No. 1, pp. 364).—The 11,195 titles in this bibliography of the literature of corn are arranged alphabetically by subject and are followed by an author-topic index. A table of contents is also included.

Effectiveness on cotton soils of granulated mixed fertilizers of different particle size, J. J. SKINNER, N. MCKAIG, JR., J. O. HARDESTY, E. R. COLLINS, G. B. KILLINGER, and S. V. STACY. (U. S. D. A. and N. C., S. C., and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 314-324).—When cotton received granulated complete fertilizers of 4 to 6, 5 to 10, and 10 to 20 mesh size and powdered and standard materials of like composition, 1937-39, granulation did not affect emergence of plants or availability of nutrients. Slightly less soluble salts were in the soil of the seed zone with granulated fertilizers, and the quantity lessened with increase of particle size. At the end of the crop season analyses showed losses from the 4 to 6 mesh granules of practically all of the N, about 97 percent of the K, and about two-thirds of the P. Losses of Mg and Ca were about 30 and 14 percent, respectively. Advantages of granulated fertilizers are pointed out.

Registration of varieties and strains of oats, X, T. R. STANTON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 246-251).—Oats varieties approved for registration (E. S. R., 83, p. 53) and described with performance records included Fultex, derived from Fulghum × Victoria, and Ranger and Rustler, from Nortex × Victoria, all early to midseason red oats; Vicland, from Victoria × Richland, an early yellow oats; Huron, from Markton × Victory, an early to midseason, yellowish-white to white oats; and Uton, derived from Markton × Swedish Select, a midseason, yellowish white variety.

Response of several varieties of potatoes to different photoperiods, W. C. EDMUNDSON. (U. S. D. A.). (*Amer. Potato Jour.*, 18 (1941), No. 4, pp. 100-112, figs. 3).—Studies at Greeley, Colo., 1937-39, involving 10 varieties each winter with 9-, 11-, 13-, and 17-hr. periods in the greenhouse showed that the different photoperiods had little effect on diameter of stems in the plants or on the percentage of fertile or stainable pollen. The 17-hr. plants greatly surpassed those in other periods in plant heights, numbers of bud clusters, buds for pollination and seed balls, and weights of seed balls and of seed. Varieties seem to differ widely in light requirements for flower and seed production.

Although some produced an abundance of flowers and seed with each light treatment, most varieties developed more flowers and seed with the 17-hr. photoperiod.

Results of a 5-year factorial experiment with potato fertilizers, G. V. C. HOUGHLAND and W. O. STRONG. (Va. Truck Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 189-199, fig. 1).—In field tests with potatoes at Onley, Va., 1935-39, made in $2 \times 2 \times 2$ factorial design and involving eight 6-6-5 fertilizer mixtures, main effects of the treatments showed that the 60:40 N ratio of inorganic to organic sources of N gave higher average yields than the 80:20 ratio, and that completely neutralized fertilizer outyielded that one-third neutralized. Yields produced from soluble and insoluble Mg sources differed little. As secondary effects, complete neutralization of fertilizer was more effective when soluble Mg was supplied, but not when the mixture was one-third neutralized. Fertilizers with 80:20 N ratios produced better yields with soluble Mg, whereas those with 60:40 ratios returned higher yields with Mg from an insoluble source. Complete neutralization was more effective with mixtures having an 8:20 ratio than with 60:40 ratios. A test of main effects and interactions for 1937 from an economic viewpoint showed that kieserite, with calcium limestone added to neutralize the fertilizer, produced increases over dolomitic limestone which were statistically, but not economically, significant. This also was noted in neutral mixtures when 40 percent organic N was compared with 20 percent. Nine treatment comparisons showed economic gains, but an economic loss was indicated when kieserite rather than dolomitic limestone was used with 40 percent organic N. Continued use of neutral fertilizer over 5 yr. showed no definite tendency to increase the soil pH above the initial, about pH 5; with fertilizer one-third neutralized, there was a decided tendency to lower it to about pH 4.5.

Minor element studies on potatoes in Maine, A. HAWKINS, J. A. CHUCKA, and B. E. BROWN. (Maine Expt. Sta. coop. U. S. D. A.). (*Amer. Potato Jour.*, [18] (1941), No. 8, pp. 234-239).—The sulfate salts of Ca, Fe, Mn, Ni, and Zn were added in several rates (100 lb. or less per acre) to the fertilizer, 1932-37, and B as borax to fertilizer, 1936-39, for potatoes on Caribou loam in Aroostook County. Results indicated that comparatively small amounts of B and Ni added to fertilizer may be toxic to potatoes. Small amounts of Zn tended, although not significantly, to increase yields, while Mn, Fe, and Cu had slight effect on yields. Currently there seemed to be no need to add any of these elements to fertilizer for potatoes in the county.

Effect of soil moisture and fertilizer placement on vitality of the potato seed piece, S. DUNN (*New Hampshire Sta. Cir. 59* (1941), pp. 11, figs. 6).—Whole and cut potato sets were planted in buckets at 18°-20° C. and 14°-15° in clay and sandy loam. Fertilizer treatments included: None, 28 gm. (1,000 lb. per acre) of 8-16-16 in a circular band 2 in. wide, close to seed; and 3 treatments 0.5 in. away from the seed including 28, 21, and 14 gm. Soil moisture levels involved were 50, 60, and 70 percent of saturation.

Injurious effects of the fertilizer were not evident in rates of emergence or of growth after emergence. Fertilized plants usually grew more vigorously and larger than corresponding unfertilized plants. Growth was greater in the lower temperature and in clay. Although an inhibitory effect of close placement of fertilizer was noted in early growth, it was not carried into later growth and tuber yield and its value as a criterion of fertilizer injury was doubtful. Tuber yield was usually greater with all fertilizer treatments than with corresponding unfertilized plants, with clay soil than with sandy loam, and greater in cooler than warm growing temperatures. Soil moisture effects were evident in a

greater yield with higher levels and in cool than in warm temperatures. Plants grown from cut seed in actual contact with fertilizer showed distinct injury, which was in agreement with results reported elsewhere.

Reduction of cracking of late crop potatoes at harvest time by root cutting or vine killing, H. O. WERNER and J. O. DUTT. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 7, pp. 189-208, figs. 7).—Cracking of potatoes at harvesttime, a serious grade defect of late crop Triumph potatoes in the northern high plains, seemed due to a large increase in turgidity which apparently results when transpiration is reduced greatly while the roots are well supplied with moisture or when, after a dry period, soil moisture is greatly increased while the transpiration rate is very slow. In fields irrigated in mid-September, 1940, root cutting reduced the amount of cracking very effectively while the killing of vines was slower and less extensive in effect. When soils were wet and vines senile, root cutting was less effective, for high turgidity of tubers apparently was maintained by direct absorption of water through the skin. The large amount of feeding roots in the soil above the root-cutting zone and the probable direct absorption of moisture suggest that loosening the soil to promote drying out is as essential as root cutting when several inches of surface soil remain moist. The amount of cracking fluctuated from day to day and throughout any day, increasing overnight or any time during cold or cloudy periods and decreasing during bright or windy days. Triumph and Pontiac cracked most readily, two new seedlings were less susceptible, Mesaba and Warba cracked still less, and little or no cracking was induced in Irish Cobbler, Chippewa, and Katahdin.

Rice varieties and their comparative yields in the United States, J. W. JONES, J. M. JENKINS, M. NELSON, L. C. CARTER, C. R. ADAIR, R. H. WYCHE, H. M. BEACHELL, L. L. DAVIS, and B. M. KING. (Coop. Ark., La., Tex., Calif., and Mo. Expt. Stas.). (*U. S. Dept. Agr. Cir. 612* (1941), pp. 34, figs. 12).—Brief agronomic descriptions of the rice varieties grown in the United States and their comparative yields in the principal rice-growing States are reported, with remarks on milling qualities. In Arkansas, Louisiana, and Texas, Caloro and Acadia short-grain; Zenith, Early Prolific, and Blue Rose medium-grain; and Edith, Fortuna or Arkansas Fortuna, Nira, and Texoro long-grain varieties were the most productive of the three grain types for the different maturity groups. These varieties are well suited for growing in these States, except Texoro, which cannot be grown in Arkansas owing to late maturity. In California and Missouri, Colusa and Caloro and similar short-grain varieties and selections produced the highest average yields.

Registration of improved sorghum varieties, II, R. E. KAPER. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 257-258).—Sorghum varieties approved for registration (E. S. R., 80, p. 189) in 1940 included Coes, a dual purpose sorghum originated as a selection from Modoc sorghum, and Highland, a head selection from Dawn kafir, both early, nonshattering, adapted to highlands of the sorghum region, and resistant to "weak-neck" disease.

Chlorophyll-deficient seedlings in timothy (*Phleum pratense* L.), H. WEXELSEN (*Jour. Hered.*, 32 (1941), No. 7, pp. 227-231).—Albino, yellow, yellowish white with green streaks, yellow green, and light green chlorophyll deficient seedlings have been demonstrated in hexaploid timothy. Normal green is completely dominant. For all, except for the yellowish white type, three apparently independently inherited homomeric factors have been shown to be present. A plant is normal green if only one of these factors is in a heterozygous condition. Calculations are made of frequencies of plants heterozygous for chloro-

phyll deficiencies in a local Norwegian strain and of the probable spontaneous selfing in open-pollinated plants of this strain.

The distribution of potassium in bright leaf cigarette tobacco and its influence on the quality of the leaf, M. F. GRIBBINS, J. J. REID, and D. E. HALEY. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 1, pp. 31-39, figs. 2).—Samples of bright leaf tobacco were obtained from the Chatham plats of the Virginia Experiment Station, where application of potash, the only variable in the individual fertilizer treatments ranged from 0 to 300 lb. per acre. When the quantity of K available to the plant was low, a greater concentration of K occurred in the upper leaves, and contents of reducing materials, including glucose, was relatively low in all leaves. When the K at the disposal of the plants was ample, there was a more or less uniform concentration of K in the bottom, middle, and top leaves and the production of reducing materials attained a maximum. Extremely large K applications gave rise to an increased absorption of K, with a larger accumulation in the bottom leaves, and failed to show any further favorable influence on production of reducing materials. A N:K ratio of from 0.8 to 1.1 in the leaf appears to be highly desirable. Desirable N:K ratios were obtained in 1938 from acre applications of from 60 to 120 lb. of potash, and in 1939 from 60 to 90 lb. of potash, which might be attributed in large measure to seasonal differences.

Lattice designs for wheat variety trials, W. G. COCHRAN. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 351-360, fig. 1).—The nature of lattice designs (E. S. R., 84, p. 466) and their analysis are discussed briefly, with particular consideration to the method of adjusting yields and the relative merits of randomized blocks and lattice designs.

Registration of improved wheat varieties, XIV, J. A. CLARK. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 255-256).—Wheat varieties approved for registration (E. S. R., 83, p. 55) in 1940 were Marmin, a winter wheat with semihard to hard red kernels, developed from Minturki × Marquis; and Rival, a spring wheat resistant to leaf rust and derived from a cross between Ceres and Hope-Florence. Records of performance and brief descriptions are given.

The influence of season and location on the grain of several wheat varieties, C. A. LAMB and E. G. BAYFIELD. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 294-303).—A statistical study of the influence of variety, season, and location upon yield, weight per bushel, wheat ash, and wheat protein, and the interrelationship of these factors made use of data from 10 varieties of winter wheat grown at 15 locations in Ohio, 1930-33. Related studies have been noted earlier (E. S. R., 75, p. 480; 76, p. 35; 78, p. 334). The variety-location interactions were not great but the largest effect was on yield. Evidently, serious errors would not be introduced by using composites to rank varieties for weight per bushel, wheat ash, or wheat protein. According to covariance studies, protein and ash were correlated positively and the relationship affected little by variety, season, or location. Season appeared to be more important than variety or location in causing variations in the wheat characters considered.

Factors affecting cold resistance in winter wheat, W. W. WORZELLA and G. H. CUTLER. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 221-230, figs. 3).—The Redhart, Poole, Michigan Amber, Michikof, Kanred, and Minhardi wheat varieties, in order of ascending hardness, were grown in 4-in. pots or flats in the field and were subjected to controlled freezing at regular intervals throughout the winter. The temperature of soil under a layer of ice was associated closely with atmospheric temperatures, and such soil reached

lower temperatures than that covered with snow. Soil protected with 3-5 in. of snow showed small changes in temperatures. A spread of 44° F. was recorded between temperatures of the air and snow-covered soil. Wheat plants were found to acquire and lose hardiness repeatedly, depending upon atmospheric temperatures during winter. Variations in level of hardiness were found from week to week, season to season, and among varieties. Wheats varied in degree of cold resistance, ability to accumulate hardiness and to acquire the hardened condition earlier in the fall and retain it later in the spring. Seedlings possessing from 5 to 15 leaves per plant were most resistant. Those grown on low and medium levels of fertility differed little in cold resistance, while seedlings on high levels were succulent and showed greatest injury. Plants infested with hessian fly were more susceptible to freezing temperatures than noninfested plants. Good agreement was found between results of artificial freezing and field tests involving numerous varieties and hybrid strains.

Field versus controlled freezing as a measure of cold resistance of winter wheat varieties, R. O. WEIBEL and K. S. QUISENBERRY. (Nebr. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 336-343, fig. 1).—Thirty winter wheat varieties grown in the Great Plains Uniform Winterhardiness Nursery (E. S. R., 80, p. 190) were subjected to controlled freezing to study winterhardiness. The coefficient of correlation of +0.8656 was obtained when average survivals from 24 controlled freezing tests made over 2 yr. were compared with data from the field tests. Artificial freezing tests of fall-sown plants gave the best agreement with field results when made in December. The seasonal trend of increased hardiness was found to differ among varieties.

Russian wild-rye, *Elymus junceus* Fisch, G. A. ROGLER. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 266-268, figs. 2).—Russian wild-rye is a promising new drought-resistant, bunch-type grass for use as pasture and in erosion control in the northern Great Plains. Breeding and selection work at Mandan, N. Dak., 1936, including pollination studies, is described briefly.

Measuring vitality of seeds, M. T. MUNN (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, p. 8, fig. 1).—Potential losses attributable to weak sprouting of seed, especially in old stocks, instead of the strong vigorous growth desired are illustrated by field performance of corn and laboratory germination of seeds of lettuce and other vegetables.

Oats and barley seed germinate well after eight years, W. CROSIER (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 8-9).—Oats and barley of 1933 and 1934 crops when germinated in 1941 had not declined much in germinability, and their sprouts appeared equal to those from the 1941 crop seed in vigor, color, and rapidity of germination. Seed treated with an organic mercury dust germinated much better than untreated seed in greenhouse soil but not so well on paper towels. Criteria of old seed were the presence on untreated lots of black mold and the absence of the fungi *Alternaria tenuis*, which discolors the entire oat kernel, and *Helminthosporium sativum*, which causes a browning or rot of the roots of barley sprouts. The fact that these fungi were seen in the original lots indicates that the longevity of oats and barley seed exceeds that of accompanying fungi.

Una mala yerba que pierde mucho de su maldad [A beneficial weed], J. I. O[TERO] (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 2, p. 12, fig. 1).—Since flowers of *Borreria verticillata* provide part of the adult stage food of the Brazilian wasp (*Larra americana*) parasitic on mole cricket, conservation of this weed is recommended.

Progress of germination of seed of *Digitaria* as influenced by germination temperature and other factors, E. H. and V. K. TOOLE. (U. S. D. A.). (*Jour.*

Agr. Res. [U. S.], 63 (1941), No. 2, pp. 65-90, figs. 15).—Seed of *D. sanguinalis* (crabgrass) and *D. ischaemum* (smooth crabgrass) collected 1935-38 was germinated at four temperature alternations when freshly harvested and after different storage periods. Fresh seed of both species required preliminary incubation of 28-56 days before germination started, and for completion of germination at least 196 days. As seed aged in dry storage, the rate became faster so that germination of 1-year-old seed was completed in 14 days or less. Freshly harvested *D. ischaemum* seed had the shortest incubation period at the 20°-40° C. alternation, but a small proportion was slower in germinating at 20°-40° than at 20°-35°. Germination of fresh *D. sanguinalis* seed was about the same at 20°-30° and at 20°-35°. The process was slower at the other alternations.

Prechilling the freshly harvested *D. ischaemum* seed for 8 weeks brought prompt and complete germination at the 20°-35° alternation; but as the seed aged a shorter treatment period sufficed. Seed of *D. sanguinalis* was injured by long periods of prechilling, but after 1 mo. of dry storage prechilling moist seed at 3° was followed by prompt and complete germination at the 20°-35° alternation; after 3 or 4 months' storage prechilling for 4 weeks resulted in the same germination rate as with unchilled 1-year-old seed. Moistening the substratum with 0.2 percent solution of KNO₃ hastened germination of *D. ischaemum* seed at 15°-25° and 20°-30° alternations, and retarded it at 20°-35° and 20°-40°, but had no definite effect on *D. sanguinalis* seed. Total exclusion of light did not definitely affect germination of *D. ischaemum* seed, but retarded germination of *D. sanguinalis* seed greatly at the 20°-30° alternation and slightly at 20°-35°.

Sodium fluoride as an herbicide, S. MARCOVITCH. (Tenn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, p. 367).—Sodium fluoride dust injured smartweed without damage to tobacco leaves. A solution of sodium fluoride 2 percent and soap powder 1 percent gave good control of crabgrass in lawns without causing permanent injury to bluegrass. Trials suggested that sodium fluoride also may be promising against wild mustard and wild radish. Perennials do not seem to be injured easily by sodium fluoride; quick-growing, succulent annuals with thin cuticle are most susceptible. Oxalis, sheep sorrel, persimmon, scrub pine, colias, smartweed, and crabgrass are easily injured, while red cedar, hickory, Russian olive, and holly can withstand a saturated solution of 4 percent sodium fluoride with little or no injury. For best results, the chemical should be used early in the season, while plants are tender and the cuticle is thin and permeable.

HORTICULTURE

[**Horticultural studies by the Georgia Coastal Plain Station**] (*Georgia Coastal Plain Sta. Bul. 31 (1940), pp. 84-90, 92-118, 146-150*).—Herein are discussed the results of studies of varieties, fertilizers, and culture of tomatoes, watermelons, lima beans, and cabbage; the breeding of wilt-resistant watermelons; varieties of asparagus, roasting corn, cantaloups, cucumbers, lettuce, and other vegetables; fertilizers for lettuce; varieties of peach, pecan, pear, grape, fig, jujube, blueberries, and other fruits; and the adaptation of the tung tree.

Report of the Horticultural Experiment Station, Vineland (Vineland, Ont., Hort. Expt. Sta. Rpt., 1941, pp. 7).—Among studies discussed are factors affecting the nitrate content of an orchard soil, yield and grade of peaches picked at optimum maturity and 4 and 7 days previous to this stage, cherry rootstock tests, and strawberry and vegetable breeding. A list is given of fruit and vegetable varieties developed and named by the station.

Station's horticultural work is widely followed (*Farm Res.* [New York State Sta.], 7 (1941), No. 4, pp. 4-5, fig. 1).—Data are presented on the nature and extent of fruit variety testing at the station, the objectives of the fruit breeding program, methods of distributing new varieties, the use of X-rays and chemicals in inducing mutations, dwarf fruit trees and the Malling rootstocks, fertilizer and cultural work with fruits, and outlying investigations in the Hudson River Valley and at Fredonia.

[**Horticultural studies by the Texas Station**] (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1940, pp. 20-26, 27-29, 32-34, 34-36, 118-120, 143, 146-147, 153, 155-157, 166-167, 198-199, 208-209, 212-213, 220-221, 243-245, 246-247, 247-249, 250-251, 254-255, 255, 258-259, 264-267, 268-270, 270-272).—As in the preceding report (E. S. R., 84, p. 757) there are included brief progress statements on varietal, cultural, fertilizer, propagation, breeding, and other studies with fruits, nuts, vegetables, and ornamental and other plants at the main and substations by S. H. Yarnell, J. F. Rosborough, J. C. Ratsek, B. S. Pickett, H. F. Morris, W. H. Friend, E. Mortensen, J. F. Wood, U. A. Randolph, H. M. Reed, W. S. Flory, L. R. Hawthorn, F. R. Brison, H. B. Parks, V. L. Cory, A. H. Alex, R. A. Hall, E. M. Neal, R. H. Stansel, R. H. Wyche, J. J. Bayles, P. T. Riherd, and G. H. Godfrey. Breeding investigations cover work with berries, citrus fruits, figs, grapes, peaches, plums, strawberries, cabbages, peas, sweet corn, tomatoes, okra, roses, oleanders, privet, and other plants. Examinations were made of the pollen of 39 plum varieties and 63 forms of roses. Chromosomes were determined in various plum species and varieties, in rose species, in *Zephyranthes* spp., and in citrus species and their relatives. Studies upon the mineral analyses of turnip greens and on the eradication of mesquite are also discussed.

The value of native material in breeding horticultural crops for Alabama, C. L. ISBELL. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 599-604, figs. 2).—Notable success was made in the selection of insect- and disease-resistant plant materials from the old orchards and gardens of the State. There was located, for example, a pole variety of beans possessing marked resistance to root nematodes and drought and three strains of onion that withstood low winter temperatures. Promising fruits and nuts were also found. The author believes that there may be other native plant materials adapted by years of culture and selection that should be valuable in plant improvement.

Notes on the early history of horticulture in Oregon, with special reference to fruit-tree nurseries, W. P. DURUZ. (Oreg. State Col.). (*Agr. Hist.*, 15 (1941), No. 2, pp. 84-97).—Information is presented on the beginnings of horticulture in Oregon.

Fertilizers for early cabbage, tomatoes, cucumbers, and sweet corn, J. BUSHNELL (*Ohio Sta. Bul.* 622 (1941), pp. [1]+30, fig. 1).—Dealing principally with the data for the years 1931-38, this third report (E. S. R., 59, p. 835) discusses the results attained in a long-time fertilizer study, involving four early vegetables—tomatoes, cabbage, cucumbers, and sweet corn—grown in rotation. The soil, Chenango loam and fine sandy loam, is characterized by a peculiarly low fixing capacity for P. At the end of 16 yr., plats receiving 64 lb. of phosphoric acid per acre per year contained sufficient available P to maintain the yields of tomatoes for 4 yr. without further applications. The four crops varied in their capacity to obtain P from the soil. For the first 16 yr. sweet corn produced good yields without any applied phosphate, but the other crops required phosphate from the beginning. Because of the availability of P, relatively little was required in the fertilizer, but, in general, amounts of N and K were higher than are commonly applied. Eight tons of

manure supplied sufficient K and very nearly enough P for all crops. Manure alone gave higher yields of cucumbers than did any of the fertilizer mixtures used. With the other crops, fertilizers alone gave as high, or nearly as high, yields as any combinations of manure and fertilizer. Side dressings of sulfate of ammonia increased yields of cabbage and sweet corn, but had little or no effect on tomatoes and cucumbers.

Methyl-bromide fumigation of papaya and tomato, W. W. JONES (*Hawaii Sta. Cir. 17 (1940), pp. 14, fig. 1*).—Fumigation with methyl bromide, 2 lb. per 1,000 cu. ft. for 3.5 hr., delayed the ripening of firm-ripe papaya fruits for from 3 to 4 days and the ripening of tomatoes for from 3 to 6 days, depending on their maturity. Catalase activity was reduced in the papaya. Papaya fruits absorbed small quantities of the methyl bromide, sufficient to impart a slight taste. The small amount retained by tomatoes did not affect their quality. Treated papayas were more subject to anthracnose injury, leading to the suggestion that unless anthracnose-free fruits are available the vapor-heat sterilization method is the more practical treatment. Decay was not increased in tomatoes in most cases by the methyl bromide treatment, but nevertheless it is considered of great importance that only sound fruits be fumigated. Practical suggestions are presented.

The relation of yield of staminate and pistillate asparagus plants to the rate of growth of progenies in the young stage, A. L. RICHARDSON and T. M. CURRENCE. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 613-617).—In a study of 3 pistillate and 6 staminate asparagus plants and the progenies of their 18 possible combinations, the pistillate parents did not differ significantly in yield, spear size, or in the number of spears produced. One staminate parent was phenotypically weaker than the other five. When progenies were compared, the variation in days from seeding to emergence due to the interaction between staminate and pistillate plants was highly significant, and the variation due to staminate plants was significant. With respect to weight at 2.5 mo., the variations due to the interaction of staminate and pistillate plants and that due to pistillate plants were significant.

Dry matter, sugar, and carotene content of morphological portions of carrots through the growing and storage season, H. O. WERNER. (Nebr. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 267-272, figs. 5).—Analyses of Nantes and Chantenay carrots sampled at intervals throughout the growing and storage seasons showed certain varietal differences in composition, the Chantenay roots became older, due to less sucrose in the phloem and more in marked in storage. In both varieties, carotene per unit of fresh weight was always higher in the phloem than in the xylem tissues. Both from the standpoint of carotene and sweetness, the phloem was always superior to the xylem. There was a general tendency for the relative value of the phloem to diminish as the roots became older, due to less sucrose in the phloem and more in the xylem. The amount of sucrose exceeded that of reducing sugar throughout the growing season in the phloem and xylem of both varieties, except for a brief period in the early season when the xylem contained more reducing sugar. The ratio between phloem and xylem was influenced by the cultural treatments, and a considerable variation was noted among roots of a single variety.

Hybrid varieties of sweet corn for New York—a review, C. B. SAYBE and W. D. ENZIE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 6, 11, 12, fig. 1).—In reviewing the work of the station in the breeding and testing of hybrid sweet corns, the authors discuss the procedures, varieties, and results. Golden Cross Bantam, because of productiveness, high quality, and resistance to bacterial wilt, is still unsurpassed for canning by any other commercial variety.

Corn earworm resistance and plant characters, C. F. POOLE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 605-609).—An analysis of records taken in 1934 on 34 varieties of sweet and field corn and in 1935 on 12 varieties and 17 hybrids between sweet and starchy varieties for possible relationships between earworm resistance and morphological characters failed to reveal any correlations. There was no evidence to support the belief that a long husk extension or a heavy husk confers a high degree of earworm resistance. Practically all the resistant varieties tested were southern dent varieties or hybrids obtained by crossing southern dent and northern sweet corns. The southern dent corns are tall, many-husked, comparatively late-maturing descendants of types that have become adapted through long cultivation in regions where the corn earworm thrives. The author believes that a likely field for investigation of corn earworm resistance would be a biochemical search for volatile compounds.

Gourds—their culture, uses, identification, and relation to other cultivated Cucurbitaceae, A. E. HUTCHINS and L. SANDO (*Minnesota Sta. Bul.* 356 (1941), pp. 36, figs. 15).—General information is presented based on an extensive study of the literature and on observations on plants and fruits.

What hop varieties are best for New York? J. D. HARLAN (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 7, 16).—The results of 3 years' tests are summarized with respect to yield, resin content, and general usefulness and desirability.

Descriptions of types of principal American varieties of onions, R. MAGRUDER, R. E. [WESTER], H. A. JONES, T. E. RANDALL, G. B. SNYDER, H. D. BROWN, L. R. HAWTHORN, and A. L. WILSON. (Coop. Mass. State Col. and Calif., Ohio, Tex., and Utah Expt. Stas.). (*U. S. Dept. Agr., Misc. Pub.* 435 (1941), pp. 87, pls. 29, fig. 1).—This paper, the seventh in the series (E. S. R., 83, p. 772) dealing with the important vegetable crop plants of the United States, presents descriptions of the principal varieties based on correlated studies in Massachusetts, Virginia, Texas, Utah, and California. An analysis is presented of the influence of environment on plant growth, bulb formation and characteristics, storage quality, etc. The descriptions are designed to serve as standards for varietal identification, classification, and nomenclature.

Fertilizer and storage experiments with squash, J. R. HELPER. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 618-620).—In the case of Blue Hubbard squash grown two plants per hill, 8 by 8 ft. apart, on a newly cleared soil receiving a broadcast of 15 tons per acre of stable manure, additional fertilizer in the hills increased yields significantly. Measurement of plants at weekly intervals showed those in the fertilized hills made more rapid early growth. In a second experiment on soil which had been in gardens for many years there was no marked stimulus from hill fertilization. In squash stored at 45° F. there was no appreciable benefit from waxing or dipping in copper sulfate or formalin solution, even when the blossom end was cut off to simulate field injury.

Hybrid vigor in some tomato crosses, I. M. BURGESS. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 570-572).—Crosses of horticultural varieties yielded first-generation progeny that were in many instances more productive of early, marketable fruit than one, and often both, of the parents. Pritchard crosses were particularly promising, yielding not only a larger amount of early fruit but also fruit of good size and appearance.

Heterosis in the tomato as determined by yield, A. MEYER and N. D. PEACOCK. (Univ. Tenn.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 576-580).—Certain hybrids of standard varieties of tomatoes proved superior to their

parents with respect to early and total yields. Nystate × Marglobe and Indiana Baltimore × Marglobe were sufficiently superior to their parents to have value in producing canning crops. Nystate × Marglobe yielded almost twice that of the Marglobe parent. Marglobe × Earliana was a promising cross for early and total yield of fresh market tomatoes.

Direct seeding of tomatoes vs. southern-grown plants, E. S. HABER. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 515-516).—In 1 of 2 yrs., tomato plants produced in the South and shipped to northern canning-crop areas yielded more satisfactorily than did direct-seeded plants of the same variety. In the other year, the yields were not greatly different. The results indicated that southern-grown plants, if fairly disease-free and well-grown, are satisfactory for northern use.

Nutrient or starter solutions and vitamin B for transplanting tomatoes, C. B. SAYRE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 489-495).—The inclusion of vitamin B complex with the fertilizer solution placed about the roots of tomato plants at the time of setting in the field had no beneficial effect on yield. The most effective treatment consisted of ½ pt. per plant of a solution made by dissolving 4 lb. of a mixture of 2 parts of Ammo Phos and 1 part of nitrate of potash in 50 gal. of water. The fertilizer-solution treatment is said to be supplemental and not a substitute for regular field fertilization.

The propagation of some trees and shrubs by cuttings, W. L. DORAN (*Massachusetts Sta. Bul.* 332 (1941), pp. 56).—A total of 122 species, represented in some instances by several varieties, was studied with respect to the rooting of cuttings taken at different stages of development and handled variously. The time of taking cuttings or the age of the wood was a very important consideration, the most favorable time varying with the species. Climatic differences between years affected rooting, as was shown in cherry cuttings which responded to a certain treatment one year and did not the next. The age of plant from which the cutting was taken, regardless of the age of the cutting wood used, may influence rooting. The more leaves that are left on leafy cuttings, the better is the rooting provided that wilting is prevented.

Studies with root-inducing substances, such as indolebutyric acid, showed such materials, when helpful, to be effective by extending the season during which cuttings may be taken and by inducing more rapid rooting, larger rooting percentages and more roots per cutting. Indolebutyric acid gave better results than indoleacetic acid with most species. The preparation and use of root-inducing substances and the value of potassium permanganate, sugar, and acetic acid as aids to rooting are discussed. The handling of cuttings with respect to media, relative humidities, and temperatures is described. The major part of the bulletin is given over to results with individual species.

Budding ornamental Malus on the Malling rootstocks, J. K. SHAW. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 661).—In an experiment in which a total of 10 crab apples was budded on 9 different Malling rootstocks, great differences in compatibility of the different stock-scion combinations were found. For example, there was almost a total failure of Bechtel Crab on all nine rootstocks, while some of the other crabs gave very good stands of trees. In some cases buds started well the first season but died the second year. All but three crabs failed completely on the very dwarfing Malling IX. The need of care in selecting stock and scion combinations for ornamental crabs is indicated.

Apple nutrition, M. B. DAVIS and H. HILL (*Canada Dept. Agr. Pub.* 714 (1941), pp. 32, figs. 16).—Prepared with colored plates, this publication is designed to

acquaint apple growers with the principles of effective nutrition and with the symptoms of deficiencies in various nutrient elements as are indicated by the foliage, fruit, bark, etc. The role of various elements is discussed, and the need of a balanced nutrition emphasized. General fertilizer and cultural recommendations are given.

The influence of excess water in the soil on transpiration and apparent photosynthesis of young apple trees, N. F. CHILDERS, D. G. WHITE, and F. W. SOUTHWICK. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 163-164).—The deleterious effects of excess water in the soil on the life processes of fruit trees was shown in studies with young Stayman Winesap apples. Apparent photosynthesis and transpiration were reduced 10-40 percent within 6-9 days after flooding. Certain trees showed definite reductions the first day after flooding. Leaves of trees flooded in June developed light-green areas between the veins, followed by wilting. The outstanding external difference between the flooded and the check tree roots was the appearance of several short, rather stubby, white roots on or near the main rootstocks of the treated trees.

Effect of branch ringing before and after blossoming on the fruit set of the Delicious apple, W. H. GRIGGS and A. L. SCHRADER. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 89-90).—The time of ringing branches was found highly important in obtaining the desired increases in fruit production according to studies with young, highly vigorous Delicious apple trees. Branches ringed immediately after petal fall set a significantly higher percentage of fruit than those ringed before or after this time, or not ringed at all. Ringing was accomplished by the complete removal of $\frac{1}{4}$ -in. of bark from around the base of the large branches.

Developmental studies of the apple fruit in the varieties McIntosh Red and Wagener.—II, An analysis of development, M. MACARTHUR and R. H. WETMORE (*Canad. Jour. Res.*, 19 (1941), No. 10, Sect. C, pp. 371-382, figs. 6).—In this second paper (E. S. R., 82, p. 621), the authors compare the growth in the various tissues of self-pollinated fruits of McIntosh and Wagener. For several days following pollination no increase in fruit size was apparent. Fertilization was followed by general cell division and cell enlargement, the length of the cell division period varying with the variety. Final cell size was attained first by the cells of those tissues near the center of the apple. Impressed upon the fundamental pattern of growth is the localized activity of the primary vascular bundles, the cambia of which add cells to the ground tissue. Angulation in Wagener is accentuated by this activity. With the exception of epidermis cells, final cell size is approximately equal in comparable regions of the two varieties. Differences in regional extent are due to differences in the numbers of cells in that region.

Preharvest apple spraying and fruit abscission, L. M. MURPHY. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 123-126).—Preharvest sprays of naphthaleneacetic acid had a pronounced effect in delaying fruit drop in the McIntosh apple, but had little or no effect on the Baldwin and Rhode Island Greening. In the Rhode Island Greening both the unsprayed and sprayed trees held their apples with little dropping until harvest, and there was severe dropping in both sprayed and unsprayed Baldwin trees. In the McIntosh the effect of one spray lasted for about 10 days.

Some results in controlling the pre-harvest drop of McIntosh apples (preliminary report), M. B. HOFFMAN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 97-98).—Evidence is presented on the efficacy of naphthaleneacetic acid and naphthaleneacetamide sprays in reducing the preharvest

drop of the McIntosh apple. In a closely planted, heavily fertilized orchard, unsprayed trees dropped 48 percent of their fruits from September 17 to 28, while comparable trees sprayed twice with naphthaleneacetic acid dropped about 6 percent of their fruits. Comparing two sprays, September 18 and 26, with a single spray on September 18, very little difference was recorded in the final drop, but it is believed that the cool weather prevailing on September 26 may have been a factor.

Some factors affecting the storage quality of the Cortland apple, E. F. SAVAGE. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 282-288).—Fruit harvested when the pressure test (using a Magness and Taylor instrument) was from 13 to 13.5 lb. attained the best quality and kept most satisfactorily in storage. Trees to which N was applied produced fruit which developed much less scald than that from control trees. This was explained by the fact that in the 2 yr. in which soluble solids were determined the fruit of nitrated trees had a much higher soluble solids content than that of the check trees. In growing seasons of ample sunlight and light rainfall the apples kept much better than in moist, cloudy years. It is suggested that picking should be delayed until the ground color takes on a yellow tinge, and that it may be helpful to spot-pick Cortland trees, removing the better-colored apples and leaving a higher leaf : fruit ratio for those remaining.

Influence of time of harvest on storage scald development of Rhode Island Greening and Cortland apples, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 272).—The importance of delayed harvesting in reducing scald in storage was noted in 3 years' studies. With the Rhode Island Greening some effect of season and soil fertility level was noted, but in Cortland time of harvest appeared to be the only variable factor involved. Delaying the harvest of Rhode Island Greening apples until late September resulted in larger apples, less scald, and very little break-down. Up to mid-October, Cortland apples improved in size, color, and freedom from scald in storage and after removal therefrom.

The elapsed period from full bloom as an index of harvest maturity of pears, A. L. RYALL, E. SMITH, and W. T. PENTZER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 273-281).—Working with Bartlett, Anjou, and Bosc pears, the elapsed interval from bloom to maturity was found consistent from season to season in given locations of a general area but varied somewhat between areas. The variation was due apparently in part to earliness of bloom and seasonal temperatures and in part to other factors such as soil structure, soil moisture, and rate of evaporation in the air. The variations within a district were not great enough from season to season to prevent the practical use of the interval between bloom and maturity as an index to maturity. The authors suggest that the number of days from bloom, when used in connection with firmness, ground color, and finish of the fruit, should prove a valuable adjunct to present indexes for determining the proper harvest period for pears in the western producing areas.

The final ripening period in relation to woolliness of Peregrine peaches, J. REYNEKE (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 228 (1941), pp. 19, figs. 2; *Afrikaans abs.*, pp. 18-19).—Studies of "woolliness," a name applied to the spongy, dry, or juiceless condition of certain peaches after cold storage, indicated that it is related to the condition of the fruit as it is placed in storage. Peaches placed in cold storage in a juiceless condition emerged in a juiceless condition and assumed the woolly state when subsequently ripened. When fruits were held for a day or two between picking and storing, juiciness was attained and there was no woolliness after storage. Woolliness is shown to be a continuation

of the temporary juiceless condition through which peaches pass normally before reaching the fully ripe stage. In storage, this condition becomes permanent as a result of the low-temperature effects on cell-wall hydrolyzing enzymes.

Effect of carbon dioxide on apricots and peaches under simulated transit conditions, F. GERHARDT, E. SMITH, and H. ENGLISH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 243-248, fig. 1).—That the use of CO₂ in the transportation and storage of Moorpark apricots is limited was shown in the fact that fruit held at 45° F. for 10 days in 5, 10, and 20 percent CO₂ ripened abnormally. The flesh remained pale apricot in color, was very mealy in texture, and was insipid in flavor. Fruit held for 5 days at 45° in the various environments ripened satisfactorily, with those in 10 and 20 percent CO₂ requiring from 1 to 2 days longer to attain prime dessert quality than those held in air or 5 percent CO₂. Moorpark apricots had a greater tolerance to CO₂ gas at 36° than at 45°. J. H. Hale and Elberta peaches were tolerant to concentrations of CO₂ as high as 20 percent for 10 days at both 36° and 45°. Gas concentrations of both 10 and 20 percent CO₂ retarded color development and softening during storage, with a greater effect at 45° than at 36°, while gas-stored peaches required usually from 1 to 2 days longer after storage to attain optimum quality than did air-stored fruit. The length of time that gas-stored fruit remained in prime condition was not significantly different. If a temperature of 36° could be maintained in refrigerator cars, the use of CO₂ would not be justified. At 45° a concentration of from 10 to 20 percent CO₂ might permit peaches harvested in a more mature condition to be shipped safely.

What new small fruits are doing—a survey of growers, R. WELLINGTON and H. O. BENNETT (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 3, 12, fig. 1).—Based on reports received from growers (E. S. R., 85, p. 765), the favorable and unfavorable characteristics are discussed for several raspberries and strawberries developed by the station.

New raspberry varieties and the disease situation, R. F. SUIT (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, p. 2).—Brief notes are given on the behavior of various red, purple, and black raspberry varieties, with respect to mosaic, spur blight, and anthracnose.

Studies on the respiration of strawberry and raspberry fruits, M. H. HALLER, D. H. ROSE, and P. L. HARDING (*U. S. Dept. Agr. Cir.* 613 (1941), pp. 13, figs. 2).—Based on studies with 54 lots of strawberries representing different varieties and pickings during two seasons, the coefficient of correlation between dry weight and respiratory activity was +0.72. In general, varieties having firm berries of good shipping quality had a high respiratory activity on a fresh-weight basis. At 32° F. the respiratory activity of different lots of strawberries varied from 12.4 to 18 mg. of CO₂ per kilogram of fresh weight per hour. The CO₂ evolved increased with increased temperature and averaged 1.7 times as great at 40°, 3.4 times as great at 50°, 5.3 times as great at 60°, 8.6 times as great at 70°, and 13 times as great at 80° as at 32°. A similar relation was found also for O₂ consumed. The relative humidity of the surrounding atmosphere had no effect on the respiratory rate. In an atmosphere of N₂ the rate of CO₂ output at 32° gradually decreased below that in air and after from 3 to 4 weeks became less than 50 percent of the rate in air. With anaerobic respiration, alcohol was formed and the rate of sugar loss was more rapid than with aerobic respiration. Respiratory activity of red, purple, and black raspberries was determined at 32°, 40°, and 60° and was found to be of about the same order of magnitude as strawberries.

The experimental induction of parthenocarpic strawberries, A. W. S. HUNTER (*Canad. Jour. Res.*, 19 (1941), No. 10, Sect. C, pp. 413-419, fig. 1).—

Parthenocarpic development of the fruits of three pistillate strawberry varieties—Louise, Portia, and Simcoe—grown in the greenhouse was obtained by spraying unpollinated blooms with solutions of indolebutyric acid, 1-naphthylacetic acid, and colchicine, and by dusting with powdered acenaphthene: The development of fruit from blossoms which were not directly treated is attributed to the translocation of the chemical or some other substance from the treated to the untreated blooms. It is suggested that colchicine, and possibly other substances, induced parthenocarpy by acting as mobilizers of another substance or substances that moved into the ovary and there initiated development.

Relation of time of pruning to performance of grapes, C. A. MAGOON and I. W. DIX. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 369-372).—Beginning on November 1 and continuing at monthly intervals up to and including April 1, vines of Concord, Delaware, and Ontario were pruned with no evidence of injury resulting from either early or late pruning. Yield data failed to show any significant effect of the time of pruning, despite the fact that there was a heavy loss of sap following the April pruning. The results suggested that in the latitude of Beltsville, Md., and probably southward grapes may be pruned at any time from leaf fall to bud swelling in the spring.

The influence of soil temperature on the rate of transpiration of young orange trees, S. H. CAMERON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 75-79, figs. 4).—That the temperature of the soil may exert a profound influence on the rate of water loss from the leaves of young orange trees was shown in an experiment with Valencia trees planted in boxes of soil, the temperature of which was under control. As the soil temperature was reduced from 90° to 43° F., there was a marked reduction in water loss from the foliage. The effect was most pronounced during daylight, when water losses were approximately 10 times those occurring during the night.

Effect of time and amount of harvesting on alternate bearing and fruit size in the Valencia orange, R. W. HODGSON, S. H. CAMERON, and E. R. EGGERS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 196-202, figs. 3).—Early harvesting of the whole or a portion of the crop was found beneficial in reducing the tendency toward biennial bearing in Valencia oranges growing in the coastal districts of southern California. Heavy crops when allowed to remain on the tree depressed tree growth and reduced the set of fruit in the succeeding crop.

Experimentos hidropónicos (en agua) con piña (Water culture experiments with pineapples), N. A. SCHAPELLE (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 2, pp. [2-4], figs. 9).—A description is given of the equipment, solutions, and methods employed in growing pineapples in nutrient solutions, pointing out the value of the technic for determining the effect of mineral deficiencies and of pH on the growth of this tropical fruit.

Report on the prospects of cinchona cultivation in India, A. WILSON and T. J. MIRCHANDANI (*Imp. Council Agr. Res. [India]*, *Misc. Bul.* 29 (1939), pp. [1]+VI+121, pl. 1).—Early attempts in India to produce cinchona failed because of unfortunate selection of species and unfavorable economic conditions. The present survey indicated that there are some 38,000 acres of land in India that might be utilized in producing cinchona, and that there is a potential annual use in India for 600,000 lb. of quinine. With better strains of cinchona, improvement in cultural methods, and reduced costs of extraction and distribution, it is believed that production might be placed on a profitable basis.

The growth of snapdragons, stocks, and cinerarias on some Iowa soils, E. C. VOLZ and F. H. STENSTROM. (Iowa Expt. Sta. and Univ. Ill.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 242-246).—Snapdragons grown in compost and

in Knox, O'Neill, Clarion, Webster, Wabash, and Clinton soils, the fertilizer treatments of which were identical, showed significant differences in stem length but not in the number of flower spikes. Stocks grew well and uniformly on all of the soils. Cinerarias grew best in the compost, with some insignificant differences among the soil types. The results indicated that, with proper treatment, any of the soils could be made to produce good flower crops.

The gladiolus, F. T. McLEAN (*New York and London: McGraw-Hill Book Co., [1941], pp. XII+197, pls. 16*).—This book, containing general information on propagation, varieties, culture, etc., presents a noteworthy account of the development of the modern gladiolus and on hybridizing methods and inheritance.

Adsorption of mercuric chloride from solution by gladiolus corms, R. H. NELSON and C. C. CASSIL (*U. S. Dept. Agr. Cir. 610 (1941), pp. 11*).—A capacity load of gladiolus corms contained in a burlap sack and soaked for 7 hr. or longer removed 50 percent or more of the mercuric chloride from a 1:1,000 solution. The length of the soaking period did not significantly affect the quantity adsorbed from solutions of the same temperature. Where 17-hr. immersion tests at 60° F. and 73°–75° were compared, the quantity of chemical removed from solution was significantly increased in the warmer solution. The volume of the solution was reduced only about 10 percent by a 17-hr. soaking. Corm size did not appear to affect the quantity of chemical adsorbed. About 31 percent of the initial 1 gm. of mercuric chloride per liter of water was taken up by the burlap sacks, and the remaining 20 percent or more was taken out of solution by the corms. However, the addition of one-half the initial quantity of mercuric chloride to solutions previously used for a 17-hr. soaking resulted in a wide variation in the strength of different lots, suggesting the desirability of using a fresh solution for each lot of corms unless the strength of the solution is checked by chemical tests.

The prodigious Ophelia rose, C. D. PARIS and T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.], 75 (1940), pp. 268–277*).—A total of 483 varieties of cultivated roses were traced back to the Ophelia variety as a parent. Of these, 307 were seedlings and 176 were sports. A tabulation of the descendants is presented.

Date and rate of lawn seeding, L. E. LONGLEY (*Minnesota Sta. Bul. 355 (1941), pp. 8*).—Seed of a mixture of 60 percent Kentucky bluegrass, 20 redtop, 10 perennial ryegrass, and 10 percent white clover was sown on freshly prepared soil at different dates in the 6 mo. beginning in May. The most favorable period was August 15 to September 15, and the poorest results came from late autumn seedings. The time of seeding influenced the proportion of grasses and clover, with early summer seedings increasing and autumn seedings decreasing the clover. The best rate of seeding appeared to be between 3 and 4 lb. per 1,000 sq. ft. Lesser amounts were successful, but failed to give a good coverage the first season,

FORESTRY

Publications on forestry, 1935–1940, I, II (*U. S. Dept. Agr., Forest Serv., 1941, pts. 1, pp. II+29; 2, pp. IV+88*).—An annotated list, including reviews, abstracts, and other information. Part 1 deals with books and part 2 bulletins and pamphlets.

Nursery practice for trees and shrubs suitable for planting on the prairie-plains, H. E. ENGSTROM and J. H. STOECKELER (*U. S. Dept. Agr., Misc. Pub. 434 (1941), pp. 159, figs. 53*).—Information is presented on the collection and handling of forest seeds, selection and preparation of the site for the nursery, germination

and seedling culture, digging and grading nursery stock, winter storage, seedling protection from disease, insects, and unfavorable climatic factors, etc.

Sow coniferous tree seeds this fall, C. E. HERR (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 2, 10).—Stating that the fall sowing of coniferous seeds has become a common practice in many nurseries in the Northeast, the author discusses dormancy in seeds with special attention to the requirements and best methods of handling the various species.

The root systems of northern Ontario conifers growing in sand, M. W. BANNAN (*Amer. Jour. Bot.*, 27 (1940), No. 2, pp. 108–114, figs. 10).—Observations on trees growing under natural conditions on a sand plain near the northeast shore of Lake Superior showed the root systems of both young and old *Larix laricina* and *Picea mariana* to be shallow in most cases and to resemble the platelike habit characteristic of swamp-grown trees. Much greater diversity was recorded in the roots of young *P. glauca* (= *canadensis*) trees, some being shallow and others deep. Older trees of this species had roots of variable form but more uniform depth. Roots of *Abies balsamea* were less variable than those of *P. glauca*. but the average depth was similar. Jack pine had the deepest roots of all, both in the young and mature trees, and this species was the most vigorous of all the conifers examined. In individual trees of *P. glauca* and *A. balsamea* there was no correlation between stem growth and the depth of the roots.

Factors influencing the reproduction of *Pinus yunnanensis* Franch. and *Pinus armandi* Franch., Y. C. CHEO (*Sinensia*, 11 (1940), No. 5–6, pp. 415–425; *Chin. abs.*, p. 425).—Among favorable conditions for the reproduction of both species are north exposure, open stand, sparse undergrowth, scanty litter, and gentle slope. *P. armandi*, being rather tolerant, differed from *P. yunnanensis* in that it regenerated thriftily in thin as well as open stands and under thick litter as well as scanty litter. Of all factors, litter played a most important role in the reproduction of *P. yunnanensis*, but seemed to have a negligible effect on the regeneration of *P. armandi*.

Slash pine adaptations studies (*Texas Sta. Rpt. 1940*, p. 213).—Information is presented on growth performance, by H. F. Morris.

The growth and development of a mixed-conifer plantation, L. J. YOUNG (*Mich. Acad. Sci., Arts, and Letters, Papers*, 26 (1940), pp. 153–158, pls. 3).—Studies on a plantation consisting of a stripwise mixture of five conifers and established in 1903 upon a 35-acre tract located near Negaunee, Mich., led to the conclusion that stripwise plantings are inadvisable unless the species on adjacent areas have similar rates of height growth. The ill effects of disparities in rates of growth were greater on narrow strips. Stripwise planting did not prevent serious damage to white pine by the tip weevil. Scotch pine should be from seed of a suitable source. Norway spruce grew well, except on areas dominated by pine, and was free from any appreciable damage. Red pine excelled the other species in all respects. Douglas fir was so badly suppressed and deformed that no measurements were taken. In terms of volume alone, disregarding quality, production of wood was good, with average yields for the entire plat during the 5 yr. from 1933–38 of 1.196 cords per acre per year on a basis of 100 cu. ft. per standard stacked cord.

Effect of furrowing on natural reproduction of hardwoods, R. R. PATON (*Ohio Sta. Bimo. Bul.* 212 (1941), pp. 161–168, figs. 4).—A study was made of the problem of reestablishing forests on areas, such as grazed woodlots, where the original stand had become depleted and a heavy sod formed. Furrows were plowed at 6-ft. intervals throughout such an area. Seedlings planted in the furrows were partly destroyed by rabbits, but volunteer hardwood seedlings

came in abundantly. Furrowing is evidently an effective means of encouraging volunteer seedlings if parent seed trees are available. The accumulation of leaves in the furrows is an important factor by protecting the young trees and improving moisture conditions. It is recommended that furrows be spaced 3 or 4 ft. apart at right angles to the prevailing winds, except on hilly areas, where the furrows should follow the contour. Planting will be unnecessary if adequate and desirable species of seed trees are present.

Growth on cutover spruce-fir pulpwood lands on northern Michigan, A. B. BOWMAN. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 26 (1940), pp. 123-133, figs. 5*).—Analyses of data collected on 83 cut-over plots indicated that the most important factors affecting volumes on such areas are residual basal area at the time of cutting, elapsed time after cutting, and site quality. Growth in merchantable volume for black spruce, northern white cedar, and white spruce-balsam fir-paper birch types averaged 0.2, 0.45, and 0.55 cords per acre per year, respectively. Growth rates of spruce and fir compared favorably with those of associated species and suggest that if these two are given a fair opportunity they can maintain themselves against all opposition. Heavy cutting is more apt to cause changes in composition in the white spruce-balsam fir-paper birch type than in the black spruce type, although it is not so likely to denude the site. Recovery of cut-over spruce-fir pulpwood lands depends on the nucleus of spruce and fir left after logging, the rates of growth of these and associated species, the dominance of inferior species left after logging, and the tendency of shrubs to monopolize the site.

Creosoted tamarisk fence posts and adaptability of tamarisk as a fine cabinet wood, G. E. P. SMITH (*Arizona Sta. Tech. Bul. 92 (1941), pp. [2]+219-254, figs. 15*).—This bulletin is in two parts, of which the first, concerned with creosoted tamarisk fence posts, takes up the tree itself, its climatic adaptation, botanical characteristics, the characteristics of the wood, and the growing, cutting, and seasoning of tamarisk; coal-tar creosote and alternative materials; and creosoting investigations. It was found that the condition of the home-treated fence posts after 5 yr. indicated a useful life of at least from 12 to 15 yr. Creosoting by the open-tank method is recommended.

The second part of the bulletin deals with the adaptability of tamarisk for use as a fine cabinet wood. Although definite conclusions are not yet offered, on the basis of the tests thus far completed tamarisk wood is described as very heavy, very hard, strong, moderately stiff, with large shrinkage, and with high shock resistance. Machining tests on a small part of a single bolt indicated that the wood turns about as well as birch and maple. In planning (30° cutting angle only), the sample tested was found to rank fair and to be in the same class as red gum. The boring qualities place tamarisk in the oak class.

Studies of Chinese timber trees in reference to forest management, I, S. C. TENG (*Sinensia, 11 (1940), No. 5-6, pp. 363-395, figs. 7; Chin. abs., p. 395*).—Conducted on the east Tibetan plateau where the annual precipitation is about 40 in. and the altitude ranges from 8,000 to 17,000 ft., this study included observations on forest types and associations as affected by altitude and measurements on several of the more important species. Yield tables are presented for Yunnan pine, Chinese white pine [= Armand pine], Chinese larch, Likiang spruce, George fir, prickly oak, and red paper birch, with notes on tolerance, moisture requirements, and disease susceptibility. Practical suggestions are presented on the silvicultural management of the different forest types and species.

Fire Control Notes, [October 1941] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes*, 5 (1941), No. 4, pp. II+161-218, figs. 8).—This periodical, as usual (*E. S. R.*, 85, p. 627), contains articles relating to training of personnel, plans, equipment, etc., for combating and reducing hazards from forest fires.

DISEASES OF PLANTS

Report of the 1941 annual meeting of the Pacific division of the American Phytopathological Society (*Phytopathology*, 31 (1941), No. 9, pp. 859-865).—Abstracts begun on the pages indicated are included: Page 859, Failure of Rose Bud-Unions Caused by *Chalaropsis thielavioides*, by K. F. Baker and H. Earl Thomas; Artificial Inoculation of Plants With *Armillaria mellea*, by D. E. Bliss; Studies on Peach Viroses ["Wart," "Smooth Wart," "Crease Wart," "Peach Mottle," and a Malady Resembling X-Disease] in Idaho, by E. C. Blodgett. Page 860, The Effect of Aluminum on the Deposition of Copper on Cucumber Leaves and on Protection Against *Peronosplasmopara cubensis*, by J. F. L. Childs; A Severe Ring-Spot Virosis on Peach, by L. C. Cochran and L. M. Hutchins; Resistance and Susceptibility to Curly Top in Varieties of *Cucurbita pepo* and *C. moschata*, by B. F. Dana; Symptoms of Nutrient Deficiencies and Excesses in Citrus, by L. J. Klotz and J. C. Johnston. Page 861, Resistance of Citrus Tissue and Psorosis Virus A to Heat, by H. S. Fawcett and L. C. Cochran; The Effect of Phosphorus Nutrition on Concentration of Tobacco-Mosaic Virus, by S. Friend; Curly-Top Resistance of Sugar-Beet Plants as Influenced by Age, by N. J. Giddings; Histological Studies on the Relationship of Dodder to Healthy and Curly-Top-Infected Sugar Beets and Tobacco, by C. F. Lackey. Page 862, The Development and Spread of Pierce's Disease of Grapevines, by W. B. Hewitt; The Feeding of Nematodes Before and During Their Entry Into Roots, and Some Soil-Moisture Relationships of the Root-Knot Nematode, both by M. B. Linford; The Effect of pH on the Inactivation of Tobacco-Mosaic Virus by X-Rays, by A. Marshak and W. N. Takahashi. Page 863, Crown Rot of Rhubarb Caused by *Pythium* spp., and Root Rot of Barley Caused by *Pythium hypogynum* n. sp., both by J. T. Middleton; *Phytophthora* Bleeding Canker of *Quercus agrifolia*, by P. A. Miller; Vitamin B₁ and the Development of Cantaloup Powdery Mildew [*Erysiphe cichoracearum*], by D. E. Pryor; The Reaction of Cantaloup Strains to Powdery Mildew [*Erysiphe cichoracearum*], by D. E. Pryor and T. W. Whitaker. Page 864, Tomato Plant Populations in Relation to Curly-Top Control, by M. Shapovalov, H. L. Blood, and R. M. Christiansen; Mortality of the Red Scale [*Aonodiella aurantii*] on Lemons Through Infection With a Spore-Forming Bacterium, by V. P. Sokoloff and L. J. Klotz; A Virus Inactivator From Yeast, by W. N. Takahashi; Buckskin Disease of Stone Fruits, by H. Earl Thomas and T. E. Rawlins. Page 865, Bordeaux Increases Water Loss From Inert Surfaces, by C. G. Weigle; Stimulatory Action of Egg Yolk in the Culture Medium on Conidia of Powdery Mildews, and Evaluating Sulphur Fungicides for the Control of Downy Mildews, both by C. E. Yarwood.

The Plant Disease Reporter, [September 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), Nos. 16, pp. 411-430; 17, pp. 431-451, figs. 2).—In addition to the host-parasite check-list revision, by F. Weiss (No. 16, *Myrcia* to *Oxydendrum*, and 17, *Pachistima* to *Phoenix*), the following items are noted:

No. 16.—Anthracnose (*Colletotrichum* sp.) and wildfire in Maryland tobacco plant beds, by E. A. Walker and S. E. Wise; phosphate deficiency of sugar beets in Montana, by M. M. Afanasiev; relation of flea beetle control to control of *Alternaria solani* on tomatoes, by J. W. Henberger and A. E. Dimond; bacterial

ring rot of potato in New Hampshire, by M. C. Richards; brief notes on yellow-red peach virosis in Pennsylvania, fire blight on apples in New Hampshire, *Helminthosporium* blight of corn in Pennsylvania, and tulip mosaic in New Hampshire; and second New York peach X-disease clinic a success, by E. M. Hildebrand and D. H. Palmiter.

No. 17.—Diseases of medicinal herbs at the College of Agriculture, Athens, Georgia, by J. H. Miller, R. G. Grogan, and R. A. Bowden; some diseases of drug plants and herbs observed in southern California, by H. G. MacMillan; geographical extension of *Stemphylium solani* on tomatoes, by C. F. Andrus; tomato diseases in the Norfolk area and on the Eastern Shore of Virginia, by H. T. Cook and T. J. Nugent; survival of *Phyllosticta solitaria* in New York, by W. D. Mills and F. H. Lewis; and brief notes on Dutch elm disease in 1941, leaf spot on Chinese cabbage in Pennsylvania, and spread of dwarf bunt (*Tilletia tritici*) of wheat in Western States.

[Progress in plant disease studies by the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 31 (1940), pp. 29-30, 90-92, 118-123, 130-138, 143-145*).—Brief notes are given on sulfur dust for controlling peanut leaf spot; tomato plant disease studies, including the distribution, dissemination, and temperature and humidity relations of early blight (*Macrosporium solani*), its relations to age of plants, control of early blight and other diseases by seed treatments, tests of bordeaux and fixed copper fungicides, and disease in the fruits as affected by post-harvest wilting; studies of root knot nematodes, including control by chemicals, the modes and rate of spread, the effect of root knot on cucumbers, resistant field, truck, and ornamental plants, the effect of cover crops on root knot of peaches and root knot-resistant peach rootstocks, the effects of root knot on seedling tung trees, and susceptible and resistant grasses; and flue-cured and shade tobacco diseases, including disease surveys of the 1939 crop, downy mildew (blue mold) control by spraying, gas treatments, and culture practices, and root knot control by crop rotation and in seed beds.

[Phytopathological work by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1940, pp. 15, 83-87, 88-91, 147-148, 163-164, 168-170, 170-173, 182-183, 219-220, 221-222, 224, 245, 247, 249, 253, 259, 267-268, 272-275*).—Brief progress reports (by J. E. Simpson, W. N. Ezekiel, C. H. Rogers, C. Nelson, Jr., A. A. Dunlap, L. M. Blank, P. J. Talley, F. M. Eaton, N. E. Riger, G. A. Greathouse, A. L. Harrison, G. E. Altstatt, G. M. Watkins, H. F. Morris, E. W. Lyle, E. C. Tullis, C. E. Minarik, P. A. Young, H. Rich, G. H. Godfrey, L. E. Brooks, B. S. Pickett, and S. S. Ivanoff) are presented on studies of cotton or Texas root rot, including pH tolerance and the effects of B, Fe, and Se on the causal fungus (*Phymatotrichum omnivorum*), variations in strains of the fungus, chemical treatment of trees and shrubs for root rot, nursery test notes including new hosts, methods of eradicating root rot in nurseries and orchards in deep sandy soil, inoculation of cotton plants in sand cultures, relation of varieties and fertilizers to root rot, sulfur and sulfur-compost additions to infested soils, factors influencing the fungus growth on different N sources, carbohydrates and nutritional relationships of the cotton plant to root rot, chemical investigations of resistance to root rot, distribution and viability of the sclerotia, effect of rate of planting cottonseed on root rot, residual effect of different soil treatments on root rot in cotton, rose, and privet, soil treatment for root rot and chlorosis control on roses, relative humidity as affecting the death rate of cotton plants with root rot, residual effect of crude oil, crank case drainings, and cotton bur ashes on germination of cottonseed, root rot, and yield of cotton, residual effect of applications of crude oil at different depths on germination of cottonseed, cotton root rot, and yield of cotton, application

of copper sulfate and crude oil plus deep tillage as affecting root rot in cotton, germination and yield of cotton from seed from plants killed by root rot at different dates in 1939, comparative root rot resistance and yield of different varieties of cowpeas, fertilizers in rotation and continuous cotton as affecting root rot and crop yields, crude oil treatment on cotton land, sorghum as a root rot remover, and grape and apple resistance to root rot; cotton angular leaf spot in relation to fertilization, varietal susceptibility, spraying and dusting, and seed treatments; cotton varietal resistance to root knot, and control of root knot by soil fumigation with chloropicrin (watermelon and okra used as test plants); seed treatment of oats; tomato diseases, including *Fusarium* wilt (influencing factors and varietal resistance), blossom-end rot and puff, spraying, dusting, and seed treatments, the effect of chemicals on the sclerotia of *Sclerotium rolfsii*, leaf and fruit diseases avoided by use of new chemicals, and light in relation to damping-off of seedlings; *Pythium* root rot-resistant strains of milo; garlic diseases; clove disinfection; histopathology of spinach white rust; summer sprays for peaches; rose diseases, including the histopathology of black spot and fungicides for its control, *Diplodia* dieback, crown gall in relation to colchicine, resistance to root knot, and chlorosis control; rice diseases, including black kernel disease control, field and cylinder experiments on the straighthead disease, and calcium and magnesium in relation to white tip disease; papaya root rot and wilt; banana nematode root disease; citrus chlorosis and gummosis; control of potato psyllid yellows and scab, and late blight v. weather; breeding spinach for disease resistance, onions for pink root resistance, and cantaloups for resistance to downy mildew and other diseases; cabbage black rot; noninfectious chlorosis of vegetable and feed crops, with cowpeas as test crop; and summary of plant diseases giving most trouble during 1940.

Lightning injury to farm crops (*New Jersey Stas. Plant Disease Notes*, 19 (1941), No. 1, pp. 4).—Symptoms are described, with special reference to potatoes, tomatoes, raspberries, and grapes.

Chemical properties of viruses, W. M. STANLEY (*Sci. Mo.*, 53 (1941), No. 3, pp. 197-210, figs. 14).—A summary of present knowledge on the subject, with special attention given to tobacco mosaic and tomato bushy stunt viruses and including electron photomicrographs.

Control of plant virus diseases by cultural methods, I. W. SELMAN (*Nature [London]*, 147 (1941), No. 3719, pp. 181-182, fig. 1).—This is a brief review and discussion (with diagrammatic scheme) of the interaction of virus infection and environal factors on the plant and work in progress at the Cheshunt Experimental and Research Station at Herts, England, to determine the extent to which the losses from virus diseases may be reduced by appropriate treatments.

A virus disease of *Ageratum conyzoides* and tobacco, C. H. GADD and C. A. Loos (*Trop. Agr. [Ceylon]*, 96 (1941), No. 5, pp. 255-264, pls. 3).—The disease of *A. conyzoides* described, the principal symptom of which is yellow veining, was transmitted to healthy *Ageratum* plants by grafting and to tobacco by white fly. It was found due to a virus allied to the causal agent of tobacco leaf curl. Eradication of the weed from tobacco areas is advocated.

Descriptions of *Elsinoë dolichi* n. sp. and *Sphaceloma ricini* n. sp., A. E. JENKINS and C. C. CHEO. (U. S. D. A. et al.). (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 9, pp. 415-417).—*E. dolichi* on hyacinth bean and *S. ricini* on castor-bean.

On *Anguillulina multicincta* (Cobb) and other species of *Anguillulina* associated with the roots of plants, T. GOODEY (*Jour. Helminthol.*, 18 (1940),

No. 1, pp. 21-38, figs. 32).—Since publication of an earlier paper⁴ the author has made further observations on the morphology and anatomy of some species of *Anguillulina* associated with plant roots, and here presents such data on *A. multincincta* from banana roots in Samoa and the French West Indies, *A. erythrinae* from pasture turf samples in England, *A. robusta* from soil about grass roots, and *A. obtusa* parasitizing roots of three grass species.

The Ascomycetes of Georgia, J. H. MILLER. (Coop. Univ. Ga.). (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1941, Sup. 131, pp. 81-93).—“Georgia is surrounded by States with much early mycological development, but heretofore there has never been published a list of any of its fungi. . . . The fungi listed represent chiefly collections of the writer and students extending over the past 20-yr. period, with additions since 1937 by George Thompson, and references from papers by B. B. Higgins, W. A. Jenkins, John R. Cole, and J. B. Demaree. There are 221 genera and 761 species in this paper. Only one collection is cited from a county, except when the fungus occurs on a different host. The species are arranged alphabetically within taxonomic groups, and under each is placed the hosts and county in which collected. Most of the collecting has been in the piedmont region of northeast Georgia and the adjoining mountain counties.”

Witches' broom disease investigations.—I, Seasonal variations in intensity of infection and their effect on control methods, R. E. D. BAKER, S. H. CROWDY, and C. A. THOROLD (*Trop. Agr. [Trinidad]*, 18 (1941), No. 6, pp. 107-116, figs. 7).—A marked periodicity in witches'-broom formation by *Marasmius perniciosus* on cacao was observed in a survey over two widely different localities, and it is thus assumed to be of fairly general occurrence. Records of infection appeared to indicate that the effect of a center of infection was serious for only about 100 yd. down the wind. The mushroom fructifications occurred most commonly on brooms still attached to the tree, but they were also produced on leaves of brooms, on diseased pods, and even on diseased material fallen to the ground. However, brooms attached to the trees were the most important source. Records in a wet area indicated that mushrooms are formed throughout the year, but that they are most abundant from September to January, inclusive. There appeared to be a strong correlation between mushroom formation and rainfall. The decay and final fall of brooms from the trees was found to depend largely on their situation on the trees and especially on the degree of protection afforded from wind and rain. Information on certain important features of control are still lacking, but observations over recent years lead to the suggestion of a program for removal of the brooms, which should be thoroughly tested on a field scale. If this scheme proves unsuccessful or too costly, the production of resistant or immune varieties of cacao will then become of paramount importance.

Root rot and its control, R. F. CRAWFORD (*New Mexico Sta. Bul.* 288 (1941), pp. 13).—*Phymatotrichum omnivorum* root rot is an important plant disease in New Mexico and certain other parts of the Southwest, being known to occur in Texas, Arkansas, Oklahoma, Arizona, Utah, Nevada, and California. It is a disease native to the Southwest where the soils are alkaline, and has never been reported from areas where the soil is acid. This contribution summarizes present knowledge concerning the disease, including the results of studies by the station since 1921 relative to its distribution, economic importance, hosts, symptoms, etiology, life history of the causal fungus, and control. Rotation with nonsusceptible crops has long been recommended, but less than a 3-yr. rotation has proved of little value in the Mesilla and Pecos Valleys.

⁴Jour. Helminthol., 10 (1932), No. 2-3, pp. 75-180, figs. 117.

Soil disinfection may be used in small areas, where $(\text{NH}_4)_2\text{SO}_4$ alone and in combination with other chemicals is practical and efficient. Equal parts of $(\text{NH}_4)_2\text{SO}_4$, S, and CuSO_4 are being used for ornamental trees and shrubs and have proved to be very satisfactory. Heavy applications of manure tend to increase the saprophytic bacteria and fungi in the soil, and thus to inhibit the root rot organism. Quarantines are being used to prevent the spread of this destructive disease from infected areas, and barriers have proved satisfactory in stopping local spread.

Spore germination of *Selenophoma bromigena*, E. F. DARLEY. (Univ. Minn.). (*Phytopathology*, 31 (1941), No. 10, pp. 953-954, fig. 1).—In sterile distilled water, the falcate, nonseptate spores of *S. bromigena* produced septate germ tubes from one or both ends, and the original spore remained recognizable for some time. Septa developed only in the germ tubes. On nutrient media, however, 1-2 septa were developed within the spore, both terminal and lateral germ tubes arose from the newly formed cells, and within a short time the original spore was no longer recognizable. The "septation-type" germination has been observed in spores of many collections of the fungus on several nutrient media and at 10°-30° C.

New facts about eastern snowmold, C. C. WERNHAM. (Pa. State Col.). (*Phytopathology*, 31 (1941), No. 10, pp. 940-943, fig. 1).—On the basis of this study, it is concluded that snowmold of turf in the northeastern United States is due to *Typhula itoana* rather than to *Fusarium nivale*. The relative susceptibilities of some standard strains of *Agrostis* are tabulated.

A satisfactory medium for germination of urediospores of *Puccinia graminis tritici*, W. Q. LOEGERING. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 10, pp. 952-953).—By this method, 1-2 loopfuls of a urediospore suspension are spread over the surface of 1 percent distilled water agar in a Syracuse dish and left uncovered for 2-3 hr., when germination counts are made. Convenience of observation with high power objectives, consistency of results, and elimination of the effects of chemically unclean glassware are the advantages enumerated.

Seed treatments benefit growth of cereals and corn, W. CROSBIE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, p. 10, figs. 2).—Notes on recent successful results by the station in controlling seed-borne and soil-inhabiting fungi by seed treatments, including smuts of wheat and oats and seed-decay organisms of corn.

The disinfecting value of fungicides used for treating cereal seeds and their influence on growth, H. W. MEAD (*Sci. Agr.*, 21 (1941), No. 11, pp. 717-726, figs. 3).—In an experiment described, fungi developed from cereal seeds treated with certain mercury dusts or formalin and sown on agar. Development was influenced by temperature and to some extent by the kind of fungicide used. It is believed that these growths arose from deep-seated infections and that surface-borne contaminations were effectively destroyed. In a field test, 12 wheat-seed samples relatively free from disease were divided into four portions each, one of which was sown untreated, and the others after treatment with New Improved Ceresan, Half Ounce Leytosan, and formalin, respectively. Emergence and yield data indicated that the samples had reacted differently to the various treatments and that their effects also differed in the three locations where the seed had been planted, thus showing a response to soil type and moisture. Under the conditions, formalin reduced the stand and yield significantly, New Improved Ceresan increased them significantly, and Half Ounce Leytosan gave slight increases in stand and yield. In a second field test, a sample of barley heavily infected with *Helminthosporium*

sativum was divided into two portions, one untreated and the other treated with New Improved Ceresan, and sown in randomized blocks. In this case treatment improved the stand and yield by reducing the amount of disease throughout the season.

Concentration and characterization of the emetic principle present in barley infected with *Gibberella saubinetii*, W. G. HOYMAN. (Iowa State Col.). (*Phytopathology*, 31 (1941), No. 10, pp. 871-885, fig. 1).—A procedure was developed for concentrating the emetic principle in the aqueous extract from scabby whole barley. The concentrate appeared as a yellow, thick, sirupy substance which was as effective in its emetic effect on pigs as the original extract. Analysis of this concentrate indicated N to be present, and solubility and classification tests were used in an effort to determine its nature. Attempts to isolate the toxin as a derivative or to crystallize it were unsuccessful. Tested with six alkaloid reagents, the concentrate gave positive reactions with five. Although the results indicate that the emetic principle may be an alkaloid, the data are as yet insufficient to warrant that conclusion. There are 21 references.

Wheat seed testing from the pathological standpoint with special reference to embryo exposure, R. C. RUSSELL and R. J. LEDINGHAM (*Sci. Agr.*, 21 (1941), No. 12, pp. 761-775, figs. 3).—Over 200 wheat seed samples produced in Saskatchewan were tested for presence of diseases, discolorations, or other abnormalities which might detract from their value as seed, the centrifuge test being used to determine whether a sample required treatment for bunt control. Exposure of the embryo through cracks or holes in the seed coat is considered important, permitting free access of fungi and fungicides to the embryo, and experiments indicated that this may result in reduced emergence and diminished yields. When a high proportion of embryos are thus exposed, replacement of the formalin seed treatment with one of the mercurial dusts is recommended, and in some cases it may be advisable to increase the rate of seeding.

Fall-sown spring wheat susceptible to dwarf bunt, R. H. BAMBERG. (Mont. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 10, pp. 951-952).—When sown in the fall, six varieties of spring wheat were found susceptible to the race of *Tilletia tritici* causing dwarf bunt.

A new factor for resistance to bunt, *Tilletia tritici*, linked with the Martin and Turkey factors, E. H. STANFORD. (Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 559-568, figs. 2).—The data presented indicate the existence of a new factor for bunt resistance in Rio wheat, designated as the Rio factor and assigned the symbol RR. When present in the heterozygous condition it permits about 50 percent of the plants to become infected. Factors in Baart wheat modify the effect of the Rio factor, allowing a small percentage of the plants to become infected. The Rio factor was found to be closely linked with the Turkey and more loosely with the Martin factor.

Notas sobre a bacteriose da mandioca [Notes on a bacteriosis of cassava], O. A. DRUMMOND and O. HIPÓLITO (*Ceres [Minas Geraes]*, 2 (1941), No. 10, pp. 280-307, pls. 11; *Eng. abs.*, pp. 304-305).—As a result of this general study of the bacteriosis of *Manihot utilissima* (= *M. esculenta*), the authors describe the cause as *Bacterium manihotus* n. sp. and enumerate its morphological and cultural characters. The disease may be controlled by avoidance of setting out diseased stems (the usual propagative method) and by eradication of diseased plants, since infection is spread by dew and rain. Of 70 varieties of cassava tested, 5 exhibited some resistance. There are 23 references.

Sclerotium rolfsii on cotton in Arizona, M. GOTTLIEB and J. G. BROWN. (Ariz. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 944-946, fig. 1).—The authors report serious attacks in several Arizona regions. Worst affected was an area embracing about 600 acres in the Salt River Valley, in which many cotton plants were killed. The soil of this district is also infested with root knot, but numerous fields free from this nematode showed considerable *S. rolfsii* infection. The fungus under Arizona conditions appears capable of infecting cotton plants at any stage of their growth, and the symptoms induced are described. A very significant finding was that many fields showing no dying plants had a very large amount of inoculum on the decaying stalks of the preceding cotton crop that had been plowed under.

Are ammonium salts toxic to the cotton root rot fungus? L. M. BLANK and P. J. TALLEY. (Tex. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 10, pp. 926-935, fig. 1).—Results from nutrient-solution tests, using several concentrations of $(\text{NH}_4)_2\text{SO}_4$ and ammonium phosphate with and without added CaCO_3 , present no basis for assuming that the ammonium ion per se is toxic to *Phymatotrichum omnivorum*. An acid condition, inhibiting further growth, rapidly develops when it is cultured with ammonium salts as N sources if the solution is not properly constituted. Adding CaCO_3 is effective in preventing the development of this critically acid condition. The soil culture studies show that ammonium N is a good N source for the fungus, and no evidence of toxicity was observed. The beneficial effects of treating the diseased plants with ammonium compounds are believed to result from growth responses of the host to the additional N available. In view of these studies, it seems doubtful that complete eradication resulting in permanent control of root rot can be obtained by use of ammonium salts.

Prevention of stem-break, browning, and seedling blight in the flax crop, A. E. MUSKET and J. COLHOUN (*Nature* [London], 147 (1941), No. 3719, pp. 176-177).—Experiments of 1940 confirmed the results previously reported (E. S. R., 85, p. 493) on control of seedling blight (*Colletotrichum lini*), several fungicides showing up well. A very promising measure of control of stem break and browning (*Polyspora lini*) was also obtained by these methods of seed treatment, which are briefly outlined.

Einige Untersuchungen über ein an Hanf (*Cannabis sativa* L.) auftretendes Virus [Studies of a virus occurring in common hemp], K. RÖDER (*Faserforschung*, 15 (1941), No. 2, pp. 77-81, pls. 4).—Studies are reported of a virus disease observed during recent years in hemp stands on low moor soils. The leaves exhibit interval brownish discolorations, and injuries from their loss may be extraordinarily high.

An apparently undescribed disease of the peanut (*Arachis hypogaea*), W. A. JENKINS. (Ga. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 948-951, figs. 2).—This necrosis, which preliminary studies suggest is due to mineral deficiencies, is particularly severe on the lower leaf surfaces, and affects the epidermis, mesophyll, and to some extent the vascular system.

Inheritance of reaction to common scab in the potato, F. A. KRANTZ and C. J. EIDE. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 4, pp. 219-231).—Assuming that the type of inheritance in potatoes is autotetrasomic and that the difference observed in reaction to common scab was principally due to the influence of one gene, the segregates obtained from the F_1 , F_2 , and F_3 of a cross between Accession 123 and Lookout Mountain were classified into five breeding types, separation being made in regions where the mean scab reaction of the sexual progenies showed the greatest discontinuity. The distribution of the segregates of these five types in the F_1 , F_2 , and F_3

approached that calculated on the hypothesis that Accession 123 is triplex and Lookout Mountain simplex for a gene *Sc* influencing reaction to scab, and that the five types correspond to the genotypes *Sc*₄, *Sc*₃*sc*, *Sc*₂*sc*₂, *Scsc*₃, and *sc*₄. From sexual progeny tests, 118 varieties and selections of heterogeneous origin were classified into five groups corresponding to the above breeding types as follows: (1) Hindenburg variety, (2) 7 selections and the Jubel variety, (3) 42 selections, (4) 31 selections and the Earlane variety, and (5) 34 selections and the Chippewa variety. Hindenburg (type 1) gave a progeny from which 2 segregates were isolated whose sexual progeny gave a significantly higher mean scab reaction than the progeny of Hindenburg. Crosses between types gave progenies whose mean reaction to scab agreed in general with the reaction of the selfed progenies of the parents. The Early Ohio, Triumph, and Warba were classified in type 5 from the mean scab reaction of the crossed progenies obtained when these varieties were used as female parents. An association between the color factor *P* and the mean scab reaction was observed in a study of 13 crosses. The mean scab reaction of the *P* and *p* plants for the 13 crosses was 2.49 and 1.99, respectively.

A *Xylaria* tuber rot of potato, G. D. RUEHLE. (Fla. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 936-939, figs. 2).—A field rot by a fungus identified as *X. apiculata* is described for the first time. This minor disease occurs on potatoes growing on the calcareous marl soils of southern Florida, where the fungus is found growing on willow stumps.

Potato nematode disease (*N. J. State Potato Assoc., Hints to Potato Growers*, 22 (1941), No. 4, pp. [3-4]).—Infestation of potatoes by this nematode [*Heterodera schachtii*] "has recently been reported by Mr. Cannon, in the Nassau County Farm and Home Bureau News, as occurring in the vicinity of Hicksville, Long Island."

Ueber die Bedeutung konstitutioneller Mängel für das Auftreten von Keimlingsschäden bei Soja hispida Moench. [The significance of constitutional deficiency in the appearance of seedling defects in soybeans], B. RESÜHR (Ztschr. Pflanzenkrank. u. Pflanzenschutz, 51 (1941), No. 2, pp. 65-96, figs. 15).

Pathogenicity tests on sugar beets of random isolates of *Rhizoctonia solani* Kühn from potato, G. B. SANFORD (*Sci. Agr.*, 21 (1941), No. 12, pp. 746-749, fig. 1).—Infection tests on large sugar beet roots in the field during 3 yr., using 148 isolates of *R. solani* from sclerotia on potato tubers, from lesions on potato stems, and from basidiospores of the *Corticium* stage on potato stems, all gave negative results under the test conditions. As all plants inoculated with the three control isolates of proved virulence to sugar beets were killed within 20 days at average soil temperatures of 12° and 15° C. (53.6° and 59° F.), it is evident that this pathogen could cause severe injury to the sugar beet crop of Alberta, where the tests were made. The likelihood of infection from preceding crops of potatoes is minimized by these results, but it still remains unproved that strains pathogenic to sugar beets may not be harbored by potatoes.

Root-rot of sugarcane, T. S. RAMAKRISHNAN (*Cur. Sci. [India]*, 10 (1941), No. 5, pp. 254-255, fig. 1).—Note on a root rot shown due to a species of *Pythium* resembling *P. debaryanum* except for larger sized oogonium and oospores.

***Rhizoctonia* rot of swedes**, R. W. G. DENNIS (*Nature [London]*, 147 (1941), No. 3716, p. 87).—A note on a spontaneous rot of swedes in the field shown to be due to *R. solani*, which was found to cause infection only through injuries.

Elektronenmikroskopische Untersuchung der Präcipitinreaktion von Tabakmosaikvirus mit Kaninchenantiserum [An electron microscope study

of the precipitin reaction of tobacco mosaic virus with rabbit antiserum], M. v. ARDENNE, H. FRIEDRICH-FREKSA, and G. SCHRAMM (*Arch. Gesam. Virusforsch.*, 2 (1941), No. 1, pp. 80-86, figs. 4).—Antiserum against tobacco mosaic virus was prepared in rabbits, and the precipitate produced by adding it to the virus was studied under the electron microscope. By fixation with osmic acid vapor before drying on a collodion film, the electron microscope picture of the virus aggregates was much improved.

Observations on the epidemiology of tobacco wildfire and blackfire, W. B. ALLINGTON. (U. S. D. A. and Wis. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 957-959, fig. 1).—In control chamber experiments, low light intensity was found to be an important contributory factor in the "internal" type of water soaking in tobacco leaves. The wildfire and blackfire organisms (*Bacterium tabacum*=*Phytomonas tabaci*, and *B. angulatum*=*P. angulata*, respectively) remained viable sufficiently long to account for overwintering in several common crop plants which had been infected by the water-soaking method.

Disease resistance in the vegetable crops, J. C. WALKER. (Univ. Wis.). (*Bot. Rev.*, 7 (1941), No. 9, pp. 458-506).—Following a historical sketch of the development of knowledge on plant disease resistance in general, the nature of disease resistance is discussed under various headings (disease escape, exclusion of the pathogen, resistance due to host-parasite interaction, variability of the pathogen). The relation of environment to disease resistance is also considered, and the major portion is devoted to a review of work relating to resistance in specific vegetable and root crops. There are 255 references.

Host-parasite relationships in pink root of *Allium cepa*.—II, The action of *Phoma terrestris* on *Allium cepa* and other hosts, W. A. KREUTZER. (Colo. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 907-915, figs. 3).—Continuing this series (E. S. R., 81, p. 532), onion root invasion was found to be through hyphae showing characteristic constrictions at the point of entrance. Once within the tissues, these hyphae eventually formed pycnidial primordia in the cortical and epidermal cells, as a rule affected roots then undergoing complete necrosis. Invaded cells near the promeristematic region revealed plasmolysis of their contents and nuclear distortion, and the nuclei also usually failed to take or retain a safranin stain. Uninvaded cells adjoining those containing the hyphae revealed a slight plasmolysis of their contents. Although not invading the living leaf tissue of the onion bulb, *P. terrestris* invariably attacked the dead outer scale tissue, such invasion being more evident in white than in colored varieties. Root attack by *P. terrestris* did not enable isolates of the bulb-rotting pathogen, *Fusarium vasinfectum zonatum*, to invade and rot previously uninjured bulbs, but isolates of the latter readily invaded injured bulbs though failing to affect them when they were not injured. Young crop plants other than onion shown to be susceptible to attack by *P. terrestris* were soybean, pea, cane, millet, oats, barley, wheat, corn, squash, cucumber, cantaloup, muskmelon, tomato, pepper, eggplant, cauliflower, carrot, and spinach.

Certain environral and nutritional factors affecting *Aphanomyces* root rot of garden pea, P. G. SMITH and J. C. WALKER. (Wis. Expt. Sta. et al.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 1, pp. 1-20, figs. 6).—On potato dextrose agar the most rapid radial expansion of *A. euteiches* occurred at 28° C., no growth occurred at 8° or 36°, and the optimum for disease development on plants grown in sand was at 24° and 28°. No infection was noted at 12° after 11 days, whereas nearly all plants at the optimum temperature were severely affected in that period. On phosphate-buffered potato-dextrose agar, the limits for growth were about pH 3.4 and slightly above pH 8. The optimum, as measured by radial expression, occurred at pH 4.5-6.5. An apparent isoelectric

point appeared at pH 5.9. In infested soil practically no infection occurred when the moisture was maintained at 45 percent of the water-holding capacity, but at 75 percent infection was quite severe. Under controlled nutrition in a continuous-flow sand culture inoculated by zoospore suspension, the severity of disease decreased directly with increase in total salt concentration. No infection occurred at the highest concentrations employed, but all plants were severely diseased at the lowest concentration. Varying the ratio of each of the elements N, P, and K from complete absence to an excess of that in the balanced solution had no effect on disease development. Under favorable conditions in the sand culture all plants may become infected within 5 days. Once infection takes place, high nutrient concentrations do not appear to inhibit the development of the disease. On agar cultures made from the nutrient solutions employed in the sand culture, the organism grew readily at concentrations at which infection was prevented in the sand culture. There are 21 references.

Methods of control of bacterial canker of tomatoes outlined, H. L. BLOOD. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 3, pp. 1, 11).—Methods are outlined for obtaining seed and seedbeds free from the causal organism (*Phytophthora michiganense*) on the basis of joint Federal and State investigations in Utah. These include fermentation or 24-hr. seed treatment with acetic acid (0.8–0.9 percent), seedbed sanitation, and a 3-yr. elimination of tomato growing in fields where the disease has appeared.

Sravnitel'naya kharakteristika belkov pomidora, zdorovogo i bol'nogo tabachnoi mozaikoï [Comparative characteristics of the protein of normal and tobacco-mosaic-infected tomato plants], P. AGATOV (*Biokhimiya*, 6 (1941), No. 1, pp. 37–40; *Ger. abs.*, p. 40).—The proteins of normal and mosaicked plants exhibited the same limited P content, and the amino acid content was also very similar though there were small differences in the amount of individual amino acids present.

Mold count as an index to quality of tomato juice, W. C. HAYNES. (N. Y. State Expt. Sta.). (*Canning Age*, 22 (1941), No. 9, pp. 438–439, 458, fig. 1).

Watermelon wilt (*New Jersey Stat. Plant Disease Notes*, 19 (1941), No. 2, pp. 5–8).—On the basis of preliminary tests with several varieties of watermelon showing resistance to *Fusarium* wilt, it is suggested that Pride of Muscatine and Hawkesbury are worthy of use in New Jersey in soil where wilt has been troublesome.

Studies on apple scab control, O. R. BUTLER and S. DUNN (*New Hampshire Sta. Cir. 60* (1941), pp. 15).—In this investigation, scab, usually the only serious fungus infection of apples in New Hampshire, was best controlled by a calcium arsenate-lime-sulfur solution spray, and with less spray injury than when lead arsenate was similarly used. Lime-sulfur gave somewhat better control than the wettable sulfurs, flotation sulfur, Kolofog, and Sulsol, but more spray injury was produced by it in seasons favoring such injury. There being less wind at night, somewhat better scab control was obtained by spraying at that time, and a triple-nozzle long spray rod gave better results than a short spray gun. Cane sugar added to the lime-sulfur spray did not affect scab control. Use of lime-sulfur did not "burn out" the scab fungus on foliage. During storage, scab in fruit spots enlarged faster in the fruiting area than in the visibly infected area as a whole. Conditions of value in determining the best type of spray schedule are discussed.

Pear scab control and spray injury, F. C. REIMER. (Oregon Expt. Sta.). (*Rogue River Val. Pear-O-Scope*, 8 (1941), No. 11, pp. 4–5).—A brief summary of 1940 experiences, with recommendations.

"Wet foot" tolerant peach strains, F. W. HOFMANN. (Va. Expt. Sta.). (*Va. Fruit*, 29 (1941), No. 7, pp. 17-18).—This note calls attention to peach selections showing high tolerance to standing or undrained water.

The buckskin disease of cherry and other stone fruits, T. E. RAWLINS and H. EARL THOMAS. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 10, pp. 916-925, figs. 2).—At least two strains of this virus appear to occur in California. The symptoms induced on certain stone fruits, including cherry and peach, are described. The rootstock markedly affects the symptoms on sweet cherry. There is degeneration in the phloem region of the bark that may be readily brought out by treating with phloroglucinol. Certain infected plants under glass develop pronounced vein swelling accompanied by schizogenous cavities, by hypertrophy and hyperplasia in the phloem and bundle sheath, and deposits of yellowish material in the cells of phloem ray and bundle sheath. Abscission of portions of the leaf blade is preceded by early solution of intercellular substance in the narrow abscission zone. Among the species of *Prunus*, *P. avium*, *P. cerasus*, *P. demissa*, and *P. persica* seem to be most susceptible among those studied, whereas *P. armeniaca*, *P. communis*, and *P. mahaleb* are resistant. In varieties of *P. domestica* symptoms have thus far never been observed. The plums *P. cerasifera*, *P. marianna*, and *P. subcordata* appear to be immune or highly resistant.

Transmission of diamond canker of the French prune, R. E. SMITH. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 10, pp. 886-895, figs. 3).—A peculiar malady of the French-prune tree (*Prunus domestica*, Agen variety), apparently due to a virus, is described. The symptoms, known on no other species or variety, consist in a roughening and thickening of the bark, accompanied by a slow weakening and dying of the tree. This infection was transmitted to the growth from healthy French-prune scions grafted on affected trees. Diamond canker developed in trees propagated from affected French prunes when shoots for grafting or budding were used on which visible symptoms were present. Normal-looking scions from the same trees produced growth developing no diamond canker for at least 8 yr. However, occasional trees propagated from normal-looking material develop the disease, and this seems to occur in French-prune trees from certain lots or nurseries more than others. In a small proportion of cases, when grafts from normal-looking trees were grafted on the same nonsusceptible stocks with symptom-showing scions growth from the former became affected. This disease exhibits considerable resemblance to psorosis of citrus trees.

Breeding for red stele resistance, J. H. CLARK (*N. J. Agr. [Rutgers Univ.]*, 23 (1941), No. 3, pp. 3-4).—In the breeding work at the New Jersey Experiment Stations, the Pathfinder strawberry was found to be resistant to red stele and to possess other desirable characters. A number of other selections, most of them (like Pathfinder) being related to the Aberdeen variety, have shown promising resistance, and one of these is now being propagated for distribution. The importance of sanitary measures, as well as use of resistant varieties, is stressed. Progress in the selection of improved types of elderberry is also briefly discussed.

The reaction of *Fragaria virginiana* to the virus of yellow-edge, A. A. HILDEBRAND (*Canad. Jour. Res.*, 19 (1941), No. 7, Sect. C, pp. 225-233, pl. 1, figs. 3).—"When runner-grafted to domestic plants of the strawberry varieties Premier and Glen Mary (symptomless carriers of the virus of yellow-edge) clones of the Common wild strawberry, *Fragaria virginiana* Duchesne, were found to vary widely in their resistance and susceptibility to the disease. Certain clones of noticeably more delicate growth type proved to be very highly susceptible to deterioration and exhibited complete symptom-expressing propensities. Other

clones, characterized by a particularly robust type of vegetative growth, although readily susceptible showed capacity for at least partial recovery, tending to react more like the English indicator variety, Royal Sovereign. Still other clones, also of the robust type, showed resistance that was virtually complete; thus they were eliminated from plants of the 'carrier' class."

A review of our knowledge of [citrus] melanose and its control, R. S. EDSALL (*Citrus Indus.*, 22 (1941), No. 6, pp. 3-4, 20-22, 23, figs. 2).

Chemical eradication of crown gall on almond trees, P. A. ARK. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 10, pp. 956-957).—Eradication was effected by painting the cleaned surfaces of large crown galls on bearing almond trees with certain chemicals (e. g., sodium dinitroresol—1-4 by volume, iodine—10 parts metallic I, 25 parts glacial acetic acid, 25 parts glycerine, and 50 parts methanol, or 12 parts metallic I, 15 parts glacial acetic acid, and 100 parts methanol, and by clove oil—1 part clove oil, 1 part glacial acetic acid, and 2 parts methanol).

Poinsettia scab caused by Sphaceloma, G. D. RUEHLE. (Fla. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 947-948, fig. 1).—This disease, observed in Miami, Fla., and vicinity and here described for the first time, was found due to a fungus closely resembling but distinct from *S. fawcetti* in culture. A red double variety of poinsettia was seriously affected, but the white, pink, and common red sorts are apparently free from infection. Conspicuous raised cankers are produced on stems and leaves, frequently followed by defoliation and dieback.

Diseases of trees: Gleanings from the latest reports of scientific research, L. R. TEHON (*Amer. Nurseryman*, 73 (1941), No. 11, p. 24).—Note on the failure of a young peach orchard in Kansas due to nematode attack.

Cytospora canker of Italian cypress, G. A. ZENTMYER. (Conn. [New Haven] Expt. Sta.). (*Phytopathology*, 31 (1941), No. 10, pp. 896-906, figs. 3).—A canker of cultivated *Cupressus sempervirens stricta*, known in California for at least 12 yr., was found due to *Cytospora cenisia littoralis* n. f. This strictly caulicolous fungus has killed cypress trees 8-25 ft. high, both from spontaneous and artificial infection. Found only in the cooler littoral region of California (San Diego to San Francisco), the fungus also occurs on the horizontal form of *Cupressus sempervirens*, on *C. glabra*, and on *C. macrocarpa*, but is not a serious pathogen on the last-named hosts. This form of the fungus is similar to the species in having few large locules in the stroma, but differs in the presence of a definite border of dark stromatic tissue bounding the fruiting body, as well as in several minor characters. The major dissemination of the fungus has apparently been through nursery stock and pruning operations.

Rosy-canker of London plane associated with illuminating gas injury, C. MAY, J. M. WALTER, and P. V. MOOK. (U. S. D. A.). (*Shade Tree*, 14 (1941), No. 4, pp. [2-4], fig. 1).—Note on a striking canker apparently due to poisoning by illuminating gas in the soil.

Bleeding necrosis of sweet gum, P. P. PIRONE and T. R. BENDER (*New Jersey Stas. Nursery Disease Notes*, 14 (1941), Nos. 2, pp. 5-8; 3, pp. 9-12).—First called to the author's attention in 1940, bleeding necrosis has thus far been found on trees from 8 to 75 yr. old in New Jersey and on Staten Island, N. Y. The most striking symptom is the profuse bleeding of the bark usually at or a few feet above the soil line. Death of the upper portions of the tree may occur slowly with progressive dying through the season, or the entire top may die within a relatively short time. The causal fungus, whose pathogenicity was proved, is tentatively identified as *Dothiorella berengeriana* or a closely related species. Until other control measures may be developed eradication is the means suggested. Aside from a few wood-decay fungi of minor importance, no highly

destructive fungus parasite has hitherto been reported on sweet gum (*Liquidambar styraciflua*).

ECONOMIC ZOOLOGY—ENTOMOLOGY

Transactions of the Sixth North American Wildlife Conference (*Washington, D. C.: Amer. Wildlife Inst., 1941, pp. VI+382, figs. [20]*).—The proceedings of the Sixth North American Wildlife Conference (E. S. R., 85, p. 499), held in Memphis, Tenn., February 1941, are presented in two parts, the first dealing with the general sessions (pp. 1-82), the second with the special sessions (pp. 83-377).

Wildlife Research Bulletins 1 and 2 (*U. S. Dept. Int., Bur. Biol. Survey, Wildlife Res. Buls. 1 (1940), pp. IV+37, pls. 3; 2, pp. IV+52, pls. 7, figs. 4*).—Contributions on wildlife research are: Nos. 1, Food Habits of a Group of Shorebirds—Woodcock, Snipe, Knot, and Dowitcher, by C. C. Sperry; and 2, Food Habits of the American Coot, With Notes on Distribution, by J. C. Jones.

Wildlife Research Bulletins 3 and 4 (*U. S. Dept. Int., Fish and Wildlife Serv., Wildlife Res. Buls. 3 (1941), pp. II+15; 4, pp. IV+70, pls. 3, figs. 3*).—These contributions continue the series: Nos. 3, A Study of Vitamin A in the Nutrition of Foxes, by A. D. Holmes, F. Tripp, F. G. Ashbrook, and C. E. Kellogg; and 4, Food Habits of the Coyote, by C. C. Sperry.

[**Wildlife research by the Texas Station**] (*Texas Sta. Rpt. 1940, pp. 123-130*).—The work of the year (E. S. R., 84, p. 781) reported includes wildlife resources surveys in Colorado, Harris, La Salle, and Culberson Counties; a study of the effects of introducing Texas bobwhites; cover control to influence food and shelter for quail; quail management in the Coastal Plains and prairie regions of Texas; life history of the Attwater prairie chicken; fishes of Texas; and a study of the ecology of the white-necked raven.

Summer food of the red fox (*Vulpes vulpes*) in Great Britain.—A preliminary report, H. N. SOUTHERN and J. S. WATSON (*Jour. Anim. Ecol., 10 (1941), No. 1, pp. 1-11*).—In an analysis made of the contents of 40 stomachs and of 18 fecal pellets of red fox obtained during the summer, rabbits were found to be the commonest food, followed in order of frequency by sheep, small birds, and insects. A comparison of food taken in two areas, Wales and mid-England ("Plain"), has shown that in the hill district sheep and small mammals were more frequently taken than in the Midlands.

Ornithology laboratory notebook for recording observations made in the field and studies made in the laboratory on the birds of North America, A. A. ALLEN (*Ithaca, N. Y.: Comstock Pub. Co., 1941, 4. ed., pp. III+3+204, [pls. 33, figs. 211]*).

Birds in the garden and how to attract them, M. MCKENNY (*New York: Reynal & Hitchcock, [1939], pp. XVIII+349, [pls. 48], figs. [12]*).—Of the 18 chapters comprising this work, chapter 17 is devoted to brief descriptions of birds seen in the garden and the country place (pp. 210-227) and chapter 18 to a regional list of plants that attract birds (pp. 223-326). A three-page list of references and an index are included.

An eight-winter study of central Iowa bobwhites, P. L. ERRINGTON. (Iowa Expt. Sta. et al.). (*Wilson Bul., 53 (1941), No. 2, pp. 85-102*).—Studies of the winter behavior and survival of central Iowa bobwhites, extending over eight seasons (1932-40), are reported upon, discussions of the earlier years having been noted (E. S. R., 74, p. 63; 75, p. 804; 76, p. 355). The study of populations began and ended with abundance peaks but also covered an interval of pronounced scarcity. A list of 24 references to the literature cited is included.

Notes on winter-killing of central Iowa bob-whites, P. L. ERRINGTON. (Iowa Expt. Sta. et al.). (*Iowa Bird Life*, 11 (1941), No. 3, pp. 46-49).

The 1940 bob-white season in southeast Iowa, R. MOORMAN and G. O. HENDRICKSON. (Iowa Expt. Sta. et al.). (*Iowa Bird Life*, 11 (1941), No. 3, pp. 42-46, figs. 2).

The western burrowing owl in Clay County, Iowa, in 1938, T. G. SCOTT. (Iowa Expt. Sta. et al.). (*Amer. Midland Nat.*, 24 (1940), No. 3, pp. 585-593, figs. 3).—Report is made of the feeding habits of *Speotyto cunicularia hypugaea*, the results of identifications of the food items in pellets being given in tables.

Recent findings on quail propagation, R. B. NESLLER (*Assoc. South. Agr. Workers Proc.*, 42 (1941), p. 215).—An abstract of a contribution presented at the annual convention of the Association of Southern Agricultural Workers in February 1941.

Notes on copulation of certain nematodes, W. L. THRELKELD. (Va. Expt. Sta.). (*Va. Jour. Sci.*, 2 (1941), No. 1, pp. 31-34, figs. 6).

Ornithodoros turicata: The male, feeding and copulation habits, fertility, span of life, and the transmission of relapsing fever spirochetes, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 36, pp. 1799-1802).

The rate of growth of the tapeworm *Diphyllobothrium latum* (L.), R. A. WARDLE and N. K. GREEN (*Canad. Jour. Res.*, 19 (1941), No. 8, Sect. D, pp. 245-251, fig. 1).

The cultivation of tapeworms in artificial media, N. K. GREEN and R. A. WARDLE (*Canad. Jour. Res.*, 19 (1941), No. 8, Sect. D, pp. 240-244).—Report is made of experiments with *Diphyllobothrium latum* (L.), *Moniezia expansa* (Rud.), and *Hymenolepis fraterna* (Stiles) aimed at freeing them from adherent bacteria and at the same time keeping them physiologically active in artificial media. Surface sterilization was attained by 5 minutes' exposure to a 10-percent saline solution of silver protein (Merck) or by the sedimentation method of washing in saline. No success was obtained with bacteriological media, but in a dilution of Baker's tissue culture medium A (10 drops to 5 cc. of Tyrode's solution) *H. fraterna* remained active for 20 days, considerably exceeding its normal longevity in vivo.

[Contributions in economic zoology and entomology] (In *Cornell University Abstracts of Theses, 1940*. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 251-256, 275-278).—Among the theses in this field, abstracts of which are given, are: A Study of the American Robin (*Turdus migratorius* Linnaeus), by J. C. Howell (pp. 251-254); A Study of the Larval and Pupal Chaetotaxy and the Eggs of the Four Common Inland Species of Anophelines in Southeastern United States [*Anopheles quadrimaculatus*, *A. crucians*, *A. punctipennis*, and *A. walkeri*], With Notes on Their Biology, by H. S. Hurlbut (pp. 255-256); and The [German Cock]roach (*Blattella germanica* (Linn.))—Its Embryogeny, Life History, and Importance, by L. C. Pettit (pp. 275-278).

[Entomological studies by the Texas Station]. (Partly coop. U. S. D. A., Iowa and Wyo. Expt. Stas., et al.). (*Texas Sta. Rpt. 1940*, pp. 34, 49-60, 116-118, 183, 238-239, 245-246, 247, 249, 251, 255-256, 275).—Included are brief reports (E. S. R., 84, p. 786) on studies relating to grape leafhoppers; white grubs, by H. J. Reinhard; the bollweevil, by F. L. Thomas, J. C. Gaines, S. E. Jones, W. L. Owen, Jr., and Reinhard; cotton flea hopper, by R. K. Fletcher, Gaines, Thomas, Owen, Jones, and Reinhard; pink bollworm, by A. J. Chapman et al.; cotton bollworm and cotton thrips, both by Fletcher and Gaines; rapid plant bug, by Gaines; cotton insect survey, by W. S. McGregor, Thomas, and Jones; fruit and nut insect investigations, by S. W. Bilsing and McGregor; devil's shoestring as an insecticide, by V. A. Little and G. A. Russell; truck crop insects,

including the turnip aphid, cabbage looper, common red spider, flea beetle *Phyllotreta vittata discedens* (Weise), and the southern green stinkbug, and corn earworm on flax, all by M. J. Janes; desert termite injury to native range grasses, by McGregor and Thomas; apiary inspection, by C. E. Heard and W. C. O'Neal; activities of bees, by H. B. Parks; adaptability of native plants and queen rearing for resistance to American foulbrood, both by Parks and A. H. Alex; at the Temple Substation, insect pests, by C. H. Rogers; at the Sonora Substation, sulfur feeding to lousy calves and goats, by O. G. Babcock and I. B. Boughton; at the Weslaco Substation, toxicity tests of atomized oils on scale insects, population studies of the citrus rust mite and the Texas citrus mite *Anychus clarki*, control of scale insect crawlers, tests to repel date palm fruit insects, control of cabbageworms, the tomato fruitworm, corn earworm, onion thrips, garden flea hopper, aphids and mealybug control, harlequin bug, false chinch bug, and red harvester ant, all by P. T. Riherd; and at the Winter Haven Substation, notes on the tomato fruitworm and onion thrips, by Jones.

Supplement to "Insectae Borinquenses," G. N. WOLCOTT (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 2, pp. 33-158).—A supplement to the annotated check list of the insects of Puerto Rico previously noted (E. S. R., 75, p. 806).

The common names of insects, E. O. ESSIG. (Calif. Expt. Sta.). (*Pests*, 9 (1941), No. 7, pp. 7-10, 26-27).

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1940, ET-165, pp. 3, pls. 2; ET-166, pp. 2, pl. 1; ET-167, pp. 2, pls. 2; ET-168, pp. 3, pls. 4; ET-169, pp. 2, pl. 1; ET-170, pp. [?], pl. 1; ET-171, pp. 2, pls. 2).—Further contributions (E. S. R., 85, p. 501) are A Measured Drop Method of Applying Liquid Insecticides, by E. R. McGovran, G. L. Phillips, and E. L. Mayer (ET-165); Transparent Cellophane Cocooning Units for Observing the Development of Codling Moth Pupae, by W. Machado and D. Collins (ET-166); Temperature and Humidity Regulation in Small Incubators, by W. G. Bradley and O. E. Berndt (ET-167); A Mobile Sample-Carrying Rack, by H. W. Rusk (ET-168); Improvements in the Standard Insect Sweep Net, by W. C. Cook and E. W. Davis (ET-169); Technique Employed in Producing Uniform Pea Aphid Stock for Insecticide Tests at Madison, Wis., by P. V. Stone (ET-170); and A Scoop for Collecting Large Numbers of Small Insects From Their Host Plants, by W. C. Cook (ET-171).

Method of estimating the population of an agricultural pest over areas of many square miles, G. BEALL (*Canad. Jour. Res.*, 19 (1941), No. 9, Sect. D, pp. 267-277).—A method for estimating the number of insects on a crop by sampling when the position and number of the fields involved are initially unknown is described. The Colorado potato beetle on potato crops in Caradoc Township, Middlesex County, Ont., was used. A sample was obtained by examining a randomly chosen fraction, 0.001, of each field in a random selection of the blocks into which the township is divided by roads.

Studies of fluctuations in insect populations, VII, VIII, H. F. BAENES (*Jour. Anim. Ecol.*, 9 (1940), No. 2, pp. 202-214, figs. 4; 10 (1941), No. 1, pp. 94-120, figs. 8).—In continuation of these studies (E. S. R., 74, p. 665), the button top midge *Rhabdophaga heterobia* at Syston, Leicestershire, 1934-39, is dealt with in part 7; the wheat blossom midges (the wheat midget and *Sitodiplosis mosellana* Géhin) on Broadbalk wheat, 1932-40, with a discussion of the results obtained 1927-40, in part 8.

Recent advances in entomology of interest to PCOs [pest control operators], G. E. GOULD. (Ind. Expt. Sta.). (*Pests*, 9 (1941), No. 6, pp. 10-12).

A study of the relative toxicity of the molecular components of lead arsenate, L. T. FAIRHALL and J. W. MILLER (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 32, pp. 1610-1625, pl. 1, figs. 2).—Report is made of a 2-yr. investigation of the ingestion of lead arsenate by rats to determine whether the lead or the arsenic component of the molecule, or these components in combination, are chiefly responsible for the toxicity of the substance. A list of 31 references to the literature is included.

Lead and arsenic ingestion and excretion in man, S. H. WEBSTER (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 27, pp. 1359-1368, figs. 2).—Report is made of an investigation aimed at the determination of the maximal quantities of lead and arsenic excreted daily by orchardists consuming apples which had been sprayed with lead arsenate and to obtain an estimate of the quantities of these elements ingested with the fruit.

The use of petroleum oils as insecticides, G. W. PEARCE and P. J. CHAPMAN (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 15-16).—A practical account.

Specifications and methods of analysis for tar oil winter washes ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 122 (1941), pp. IV+22).

Fumigation investigations, D. L. LINDGREN. (Univ. Calif.). (*Calif. Citrog.*, 26 (1941), No. 10, pp. 283, 312-313, 316, fig. 1).

Some preliminary experiments on the insecticidal value of certain plant extracts, more particularly those of *Delphinium brownii* Rydberg, H. T. STULTZ and N. A. PATTERSON (*Sci. Agr.*, 21 (1941), No. 12, pp. 776-782).—In preliminary comparison of seven different alkaloid mixtures with nicotine sulfate used as a standard for their insecticidal value against the brown salt-marsh mosquito and Colorado potato beetle larvae, that of *D. brownii* was found to be the most promising. The more extensive tests with the delphinium alkaloid indicate that as a contact insecticide it cannot be expected to excel nicotine sulfate, and against many of the insect forms on which it was so tested it proved distinctly inferior, notably so in the case of aphids. However, it may be expected to prove more effective as a stomach poison and feeding repellent than nicotine sulfate, particularly if combined with an adhesive such as fish oil or if adsorbed on activated carbon particles. It has no apparent value as a fumigant. Water solutions do not retain their toxicity on standing as long as those of nicotine sulfate, and some of the results also suggest that its spray residues do not retain their toxicity as long as those of nicotine sulfate, but this defect might be overcome, to some extent at least, by the adsorption of the alkaloid on activated carbon.

Les légumineuses insecticides [The insecticides obtained from legumes], E. TILEMANS (*Bul. Agr. Congo Belge*, 32 (1941), No. 1, pp. 126-193, figs. 6).—This contribution is presented with a list of 303 references to the literature relating to insecticides obtained from plants of the genera *Derris*, *Lonchocarpus*, *Millettia*, *Tephrosia* (*Cracca*), etc.

The effect of pyrethrum on the spiracular mechanism of insects, V. B. WIGGLESWORTH (*Roy. Ent. Soc. London, Proc., Ser. A*, 16 (1941), No. 1-3, pp. 11-14, figs. 2).

Biological control of insects, C. H. ALDEN (*Contact*, 7 (1941), No. 4, p. [2]).—In biological control work with the codling moth and the oriental fruit moth in Georgia, 419,692,000 individual parasites (*Trichogramma minutum*) were colonized during the period from 1930 to 1940, inclusive. Of 40,000 codling moth eggs and 2,000 oriental fruit moth eggs collected and observed, the average parasitism for that period was 56.2 and 36.3 percent, respectively. The harvest results in an experimental Elberta peach orchard in which 2,000 fruits were

scored each year revealed an almost continuous decrease in fruit moth infestation. In this orchard, in which *T. minutum* had been colonized each year, the percentage of wormy fruit was 23.9 in 1932 and by 1940 had been reduced to 0.3. That *T. minutum* was highly effective against the eggs of late-brood fruit moths was shown by the finding that 81.4 percent of the eggs collected from three Elberta orchards in August 1938 were parasitized.

Peculiar habits of beneficial insects, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 10, pp. 285, 306, fig. 1).

The problem of South African turf in relation to invertebrate pests, J. OMER-COOPER, A. E. M. WHITNALL, and E. M. FENWICK (*So. African Jour. Sci.*, 37 (1941), pp. 273-284).—The types of injury caused by insects and other invertebrates to sod in South Africa are considered, and certain new or little-known pests are recorded and briefly discussed.

Cotton insect investigations. (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul.* 31 (1940), pp. 78-79).—A progress report (E. S. R., 83, p. 654) which mentions studies on bollweevil, bollworms, and aphids and their control on upland and sea-island cotton.

The wheat field survey for 1941, J. S. HOUSER (*Ohio Sta. Bimo. Bul.* 212 (1941), pp. 168-173, figs. 4).—In this annual wheat insect survey (E. S. R., 84, p. 215) mention is made of the abundance of hessian flies, wheat jointworms, black wheat-stem sawflies, and chinch bugs in Ohio wheatfields.

Recent research in the control of peach insects in the South, O. I. SNAPP. (U. S. D. A.). (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 168-169).—An abstract of a contribution presented at the annual convention of the Association of Southern Agricultural Workers in February 1941.

Citrus pests investigation: Report on a visit to Jamaica in November 1940, R. G. FENNAH (*Jamaica Dept. Sci. and Agr. Bul.* 30, n. ser. (1941), pp. [1]+11, fig. 1).—A visit to Jamaica undertaken with a view to determining the extent of damage to citrus caused by fiddler beetles of the genus *Prepodes*, to note other damage, and to recommend control measures is reported.

Insects associated with cocoa (Theobroma cacao) in Malaya, N. C. E. MILLER (*Bul. Ent. Res.*, 32 (1941), No. 1, pp. 1-15, pls. 2).

Foliage insects of spruce in Canada, A. W. A. BROWN (*Canada Dept. Agr. Pub.* 712 (1941), pp. 29, pls. 2).—A list is given of the insect species, 101 in number, that feed on the foliage of spruce, together with notes on their most important characteristics. Only 6 of these are known to attack no other tree. These data are followed by a classified list of predators and 20 additional species of insects taken from spruce foliage and keys for identification of these foliage insects.

Insect pests in stored products, H. HAYHURST (*London: Chapman & Hall*, 1940, pp. XI+83, figs. 132).—This practical account includes a 25-page host-material list.

Specific transmission of varieties of potato yellow-dwarf virus by related insects, L. M. BLACK (*Amer. Potato Jour.*, 18 (1941), No. 8, pp. 231-233).—Experiments conducted with leafhoppers have shown that *Aceratagallia sanguinolenta* (Prov.) transmits the New York variety of the potato yellow-dwarf virus (*Marmor vulgare*) only and that *Agallia constricta* Van Duzee transmits the New Jersey variety of this virus (*M. vastans*) only. The results indicate that there exists a high degree of specificity, perhaps an absolute specificity, in the relationship between the two varieties of virus and the two related leafhoppers.

Some observations on differential feeding on maturing wheat varieties by grasshoppers, I. A. JACOBSON and C. W. FARSTAD (*Canad. Ent.*, 73 (1941), No. 9, pp. 158-159).

Notes on the oriental migratory locust *Locusta migratoria manilensis* Meyen, with special reference to its solitary phase and breeding place or outbreak area, F. Q. OTANES (*Philippine Jour. Agr.*, 11 (1940), No. 4, pp. 331-353, pls. 5).

Laboratory experiments on the improvement of poison baits for hoppers of the red locust [*Nomadacris septemfasciata* (Serv.)], 1936-37, C. DU PLESSIS and M. C. A. NOLTE (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 227 (1941), pp. 44).

Laboratory experiments on poison baits for the brown and the red locust [*Locustana pardalina* (Walk.) and *Nomadacris septemfasciata* (Serv.)] 1937-38, A. LEA and M. C. A. NOLTE (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 230 (1941), pp. 56).

Bookworms, E. A. BACK. (U. S. D. A.). (*Smithsn. Inst. Ann. Rpt.*, 1939, pp. 365-374, pls. 18).—Three groups of insects are dealt with by the author in this discussion of their attack upon books and papers, namely, (1) true bookworms, (2) termites, and (3) surface feeders.

Citrus thrips control, C. O. PERSING and R. L. BEIER. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 11, pp. 319, 350, fig. 1).—A further discussion (E. S. R., 85, p. 376) on the use of tartar emetic in the control of citrus thrips.

Clover leafhopper, *Aceratagallia sanguinolenta* Prov., T. C. WATKINS ([*New York*] *Cornell Sta. Bul.* 758 (1941), pp. 24, pl. 1, figs. 3).—Eggs of *A. sanguinolenta*, which are inserted singly in the epidermis of clover petioles, hatch in about 11 days. Five nymphal instars follow, which require a total of from 19 to 43 days (average 29.6) for completion. Usually three broods and sometimes a partial fourth develop in western New York annually. Bordeaux and pyrethrum gave significant kills of this pest. The most satisfactory pyrethrum dust generally proved to be one containing 25 percent pyrethrum "A" (or 0.125 percent pyrethrins). In one set of experiments those materials which had been found most satisfactory for the control of leafhoppers also gave the greatest reduction in the yellow dwarf disease of potatoes which is transmitted by *A. sanguinolenta*.

Capsid pests of cacao in Nigeria, F. D. GOLDING (*Bul. Ent. Res.*, 32 (1941), No. 1, pp. 83-89).

Aphididae of Nevada, with a new genus and species, E. A. DREWS. (Univ. Calif.). (*Pan-Pacific Ent.*, 17 (1941), No. 2, pp. 59-61, fig. 1).—In this second contribution (E. S. R., 83, p. 88) the occurrence of 15 species of aphids with their host plant and locality in the State is noted; the genus *Nevadaphis* is erected, and *N. sampsoni* from *Artemisia tridentata* in Douglas County is described as new.

Aphid flights observed in New Brunswick, R. P. GORHAM (*Canad. Ent.*, 73 (1941), No. 9, pp. 157-158).

A new mealy bug attacking pineapple plants in Mauritius, R. MAMET (*Bul. Ent. Res.*, 32 (1941), No. 1, pp. 57-59, fig. 1).—Under the name *Pseudococcus pseudobrevipes* description is given of a new mealybug from the fruits of pineapple plants of the Victoria variety in Mauritius.

Eradication of the parlatoria date scale in the United States, B. L. BOYDEN (*U. S. Dept. Agr., Misc. Pub.* 433 (1941), pp. 62, figs. 33).—The first date palms imported into the United States in 1890 and many imported later were infested with a scale known as *Parlatoria blanchardi* (Targ.). This pest was recognized as a limiting factor in commercial date production, and efforts were made to eradicate it. Defoliation of palms followed by the removal of the petioles and running the flame of a torch over the bole was shown to exterminate the scale.

The Arizona Experiment Station began a campaign to eradicate the pest by this method in 1907, and in 1914 the Federal Horticultural Board, cooperating with other agencies, undertook the extension of the work to all date-growing areas. Most of the originally infested plantings and many infested later were free from scale by 1927. Scale was found that year in abandoned seedling plantings. Funds later provided made possible proper surveys, clean-up, inspection, and treatment of all areas. When the project was closed in 1936 the scale had apparently been eradicated.

A physiological basis for the differential resistance of the two races of red scale to HCN, N. F. HARDMAN and R. CRAIG. (Univ. Calif.). (*Science*, 94 (1941), No. 2434, p. 187).—A preliminary account is given of California red scale studies under way that are aimed at determination of the possible existence of a difference in the cyanide insensitive respiration and also the effect of other substances on spiracular closure. Forty-six females of the resistant race and 17 females of the nonresistant race were studied. It was shown in the nonresistant race the spiracles remain closed for only about 1 min. and then open, and death follows in a short time if the cyanide concentration is lethal. In the resistant race the spiracles remain closed as long as HCN is present, or at least 30 min., and a lethal concentration of cyanide can be survived for at least that time.

Mortality of the red scale on lemons through infection with a spore-forming bacterium, V. P. SOKOLOFF and L. J. KLOTZ (*Phytopathology*, 31 (1941), No. 9, p. 864).—An abstract of a contribution in which it is shown that the adult females of the California red scale can be destroyed under controlled conditions by a denitrifying bacterium isolated from the soil and tentatively designated as *Bacillus* "C." This organism is a large motile Gram-positive rod, forming spores in the equatorial position.

Observations on rotenone and oil sprays for red scale, I. G. MCBETH and J. R. ALLISON (*Citrus Leaves*, 21 (1941), No. 8, pp. 7-8, 26).

Kerosene-rotenone spray for red scale, H. J. QUAYLE (*Calif. Citrog.*, 26 (1941), No. 11, p. 319).

The present status of scale insects infesting citrus, W. L. THOMPSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 22 (1941), No. 6, pp. 5, 8-9, 16-17, figs. 5).

Insecticidas para combatir las queresas (cochinillas) de las plantas ornamentales (Insecticides for scale insects on ornamentals), G. N. WOLCOTT (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 4, pp. [7-9], figs. 4; *Eng. abs.*, pp. [8-9]).—A popular account.

Rotenone and oil sprays: Some observations on use of toxic materials in control of scale pests, I. G. MCBETH and J. R. ALLISON (*Calif. Citrog.*, 26 (1941), No. 10, pp. 282, 310-311, figs. 2).

The European earwig, S. E. CRUMB, P. M. EIDE, and A. E. BONN (*U. S. Dept. Agr., Tech. Bul.* 766 (1941), pp. [2]+76, figs. 27).—The European earwig has become established in Massachusetts, Rhode Island, New York, Idaho, Colorado, Utah, Washington, Oregon, and California. Its survival in any given locality depends on a moderate maximum temperature and the presence of an adequate supply of soil moisture. The pest feeds largely on vegetation, although some animal food seems to be required. The eggs, which are deposited in the soil during the winter and again in May, hatch in April and June, respectively. Adults first appear in July. Pairs of earwigs enter cells in the soil for overwintering during September and October. This insect may be satisfactorily controlled by broadcasting a poison bait containing 12 lb. of wheat bran, 1 lb. of sodium fluosilicate, and 1 qt. of fish oil.

Effect of wetting agents in increasing the efficiency of sprays used in control of Japanese beetle, G. F. McKENNA and A. HARTZELL (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 465-471, fig. 1).—Report is made of a series of 34 wetting agents in combination with lead arsenate and rotenone sprays tested for control of Japanese beetle adults. "Ultröil reduced the visible residue left on the foliage by lead arsenate and caused no injury to 48 species and varieties of plants. When it was used in conjunction with lead arsenate in this way, good control of adult Japanese beetles was obtained. Daintex was satisfactory with the same combinations, but formed a cloudy solution in water and did not spread as well as Ultröil. Both Pinespray and Aerosol OT were satisfactory with lead arsenate spray in laboratory tests, but were not tested in the field."

El gusano blanco: Un problema que fue resuelto, F. SEIN (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 1, p. [7], figs. 2).—A practical account of white grubs.

The effects of various relative humidities on the life processes of the southern cowpea weevil *Callosobruchus masculatus* (Fabr.) at 30° C. ± 0.8°, H. F. SCHOOF. (Univ. N. C.). (*Ecology*, 22 (1941), No. 3, pp. 297-305, figs. 2).—Experiments in North Carolina on the life processes of the cowpea weevil at 30° ± 0.8° and various relative humidities reveal that the weevil is a euryhygric animal at this temperature. "Humidities of 0-21 percent and 80-91 percent increase both the mortality and duration of the egg stage, optimum humidity being between 44 percent and 63 percent. Insects in the larval-pupal stages develop most rapidly at 80 percent relative humidity. Approximately the same percentages of weevils emerge at humidities from 0-80 percent, but at 91 percent the mortality is increased. Humidities from 0-21 percent possibly have some effect on the mortality of the larval-pupal stages, but because of the impossibility of hatching eggs under normal conditions (44 percent relative humidity) and then transferring the newly hatched larvae to cowpeas already in equilibrium with these humidities this effect cannot be shown. The egg-larval-pupal stages considered as a unit decreases in duration as the humidity is increased, with most rapid development at 91 percent. Optimum humidity regarding survival is approximately 44 percent. Cowpeas when transferred from one humidity to another temporarily retain their original moisture content, and this temporary retention gives rise to a definite 'carry-over' effect. This carry-over influences the mortality and duration of the larval-pupal stages. The longevity of mated adult weevils is only slightly affected by humidity changes. At relative humidities of 0-3 percent and 21 percent, however, the death of all insects occurs within a short period (1.5-2 days), while at the higher humidities a much greater range (2-7 days) is evident. The rate of oviposition varies directly with the relative humidity, but this variation may be due to sampling methods. The seed coat of the cowpea has been shown to be an important factor in the humidity relations of this insect."

Biology of the cotton stem-weevil *Pempherulus affinis* Fst. under controlled physical conditions, P. N. KRISHNA AYYAR and V. MARGABANDHU (*Bul. Ent. Res.*, 32 (1941), No. 1, pp. 61-82, pl. 1, figs. 7).—This is a preliminary contribution in which an attempt is made to elucidate the intricate relationship existing between *Pempherulus* (*P. (Pempheres) affinis*), a destructive stem-boring weevil of cotton in South India, and its physical environments. A convenient technic adapted for evaluating the effects of major climatic factors, such as humidity and temperature, in the case of *Pempherulus* is described. Its occurrence only in the irrigated crops is attributable to its high requirements of moisture.

The alfalfa snout beetle: Its control and suppression [(New York] Cornell Sta. Bul. 757 (1941), pp. 50, figs. 23).—This study is reported in two parts, as follows:

I. *Control of the alfalfa snout beetle*, C. E. Palm and C. Lincoln (pp. 5-36).—Poison baits directed against adult beetles have proved the best control for this pest in New York. Of the baits tested, fruit baits and baits containing both sugar and soybean flour were most effective. Baits are first applied when the weevils begin feeding on alfalfa or migrating on plowed ground, and ordinarily three applications are made at approximately weekly intervals at the rate of 1 bu. of bait to the acre for each application. Properly constructed barriers are also effective for the control of adults. Cultural measures were valuable when used in conjunction with baits.

II. *Alfalfa-snout-beetle control and suppression program of the New York State Department of Agriculture and Markets*, A. B. Buchholz (pp. 37-50).—Scouting, baiting, mapping, and extension activities directed toward the suppression of this pest in New York are discussed.

The relation of the curculionid *Anacentrinus deplanatus* to root rot and basal stem rot of barnyard grass (*Echinochloa crusgalli*), E. W. HANSON and H. E. MILLIRON. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 9, pp. 823-837, figs. 3).—A description of *A. deplanatus* (Casey) (= *Limnobaris deplanata* Casey) is followed by a report upon its infestation in relation to the development of rots.

A revision of the Strepsiptera, with special reference to the species of North America, R. M. BOHART (*Calif. Univ. Pubs. Ent.*, 7 (1941), No. 6, pp. [3]+91-156, pl. 1, figs. 8).—This revision includes a 4-page bibliography.

Peach tree borer control, E. H. SMITH (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, p. 16).—A practical account.

The known occurrence of tomato pinworm (*Keiferia lycopersicella*) in California, H. A. HUNT and W. B. CARTER (*Calif. Dept. Agr. Bul.*, 30 (1941), No. 2, pp. 167-169, fig. 1).

Control of the corn earworm on sweet corn, A. E. MICHELBACHER. (Univ. Calif.). (*Calif. Dept. Agr. Bul.*, 30 (1941), No. 2, pp. 175-183, figs. 5).—It is concluded from field experiments that the injection of from 0.85 to 1 cc. of a highly refined mineral oil directly into the "silk channel" is the most effective means of controlling the corn earworm. The best results are obtained when the oil contains 0.2 percent of pyrethrins and has a viscosity of from 189 to 200 and an unsulfonated residue of about 99 percent. Since the oil interferes with fertilization, its application should be delayed until pollination is complete, preferably after the silk has commenced to wilt and turn brown.

The buffer capacity of the blood of the sixth-instar southern armyworm (*Prodenia eridania*), F. H. BABERS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 3, pp. 183-190, figs. 2).—The buffer capacity value for blood of the sixth-instar southern armyworm at pH 6.65 was determined as 0.022. The CO₂ content was 10.03 volumes percent, corresponding to 4.51 millimoles per liter. Of this amount, 3.52 millimoles is combined as bicarbonate and 0.99 millimole as carbonic acid. It is concluded that the buffering power of the blood is due to bicarbonates, phosphates, urates, and the salts of the proteins, with phosphorus-containing organic compounds and the amino acids probably playing an important role.

Combatiendo el barrenado de la caña con parásitos [Combating the sugarcane borer with parasites], G. N. WOLCOTT (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 3, pp. [6, 8], figs. 4).

El minador del café, F. SEÍN (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 2, pp. [9, 10], figs. 6).—A practical account of the coffee leaf miner.

The gall midges (Diptera: Cecidomyiidae) of economic importance in the West Indies, E. M. CALLAN (*Trop. Agr. [Trinidad]*, 18 (1941), No. 6, pp. 117-127, fig. 1).—Eight species of gall midges deemed of economic importance in the West Indies are dealt with, namely, the sorghum midge, *Contarinia lycopersici* Felt (tomatoes), *C. gossypii* Felt (cotton), *Porricondyla gossypii* Coq. (cotton), *Iatrophobia brasiliensis* Rübs. (cassava), *Erosomyia mangiferae* Felt (mangoes), *Asymapta mangiferae* Felt (mangoes), and *A. citrinae* Felt (citrus). Their life histories are considered, the nature and extent of the damage caused are discussed and suggestions made for their control. An analysis of infestation of sorghum in Trinidad by the sorghum midge in 1938 and 1939 is given and correlated with the yields harvested. The results of surveys of *C. lycopersici* in the Caribbean area in 1939 and 1940 are reported. This pest is now recorded from Trinidad, Barbados, St. Vincent, Grenada, St. Lucia, Dominica, British Guiana, and British Honduras. There is an apparent correlation between distribution and rainfall, the countries in which this species occurs having a higher rainfall than those in which it has not been found.

In observations of *C. lycopersici* in Trinidad, the adults were found to oviposit in tomato flower buds in the early evening after about 5:30 p. m. The infestation of flowers may be as high as 83 percent. The average number of larvae per infested flower varies from 2.5 to 16, with a mean of about 7 larvae per flower. One or two larvae in a single flower cause slight damage; a greater number cause severe injury; and more than about a dozen larvae completely destroy the flower. The larvae are very susceptible to humidities much below atmospheric saturation, and damp soil is essential for pupation. The most practical method of control is the restriction of tomato cultivation to the dry season and the maintenance of the surface layers of soil in as dry a condition as possible.

A list is given of 15 references to the literature cited.

Observations on the flight range of *Anopheles quadrimaculatus* Say, G. E. SMITH, R. B. WATSON, and R. L. CROWELL (*Amer. Jour. Hyg.*, 34 (1941), No. 2, Sect. C, pp. 102-113, figs. 2).—The results of flight experiments with stained individuals of the common malaria mosquito in which collections were made in areas adjacent to isolated breeding places in impounded water and in a natural pond are reported. The greatest distance removed from the point of liberation at which a stained mosquito was found was 2,700 ft.

The use of pyrethrum powder in colloidal solution as larvicide, H. M. JETTMAR (*Chin. Med. Jour.*, 59 (1941), No. 6, pp. 565-569).—Pyrethrum powder in colloidal solution in water killed larvae of the Culicini and Anophelini at dilutions between 1:10,000 and 1:20,000, provided they were exposed a sufficient length of time. It was shown that during the cold season *Anopheles* larvae which have been poisoned and paralyzed by fatal dilutions of pyrethrum for hours may recover entirely if transferred to pure, untreated water. Under certain conditions (water tanks, small collections of stagnant water) the application of pyrethrum in the corresponding dilutions (depending on the brand) of 1:20,000-1:100,000 in water may be recommended for radical extermination of mosquito larvae.

A symposium on human malaria, with special reference to North America and the Caribbean region, edited by F. R. MOULTON (*Amer. Assoc. Adv. Sci. Pub.* 15 (1941), pp. III+[4]+398, figs. [130]).—Following a historical introduction by M. F. Boyd, chairman of the publication committee (pp. 1-7), this symposium, in which 42 contributors have taken part, is presented under the

headings of parasitology, anopheline vectors, epidemiology, symptomatology, pathology and immunity, treatment, and control and eradication. Contributions on anopheline vectors are: General Morphology of *Anopheles* and Classification of the Nearctic Species (pp. 63-70), Distribution of the Nearctic Species of *Anopheles* (pp. 71-78), and Bionomics and Ecology of Nearctic *Anopheles* (pp. 79-87), all by W. V. King and G. H. Bradley (U. S. D. A.); The Classification and Identification of the *Anopheles* Mosquitoes of Mexico, Central America, and the West Indies, by W. H. W. Komp (pp. 88-97); Distribution and Ecology of the *Anopheles* Mosquitoes of the Caribbean Region, by L. E. Rozeboom (pp. 98-107); Factors Influencing Infection of *Anopheles* With Malarial Parasites, by C. G. Huff (pp. 108-112); and The Transmission of Malaria by the *Anopheles* Mosquitoes of North America, by J. S. Simmons (pp. 113-130). Among the contributions on control and eradication are: Methods Directed Against Adult Mosquitoes in the Control and Eradication of Malaria, by D. M. Jobbins (pp. 302-307); Housing With Special Reference to Mosquito-Proofing for Malaria Control, by C. C. Kiker (pp. 308-314); Petroleum Products for Mosquito Control, by J. M. Ginsburg and W. Rudolfs (pp. 333-336) (N. J. Expt. Stas.); Paris Green (Aceto Arsenite of Copper) and Other Stomach Poisons as Larvicides Against Mosquito Larvae, by M. A. Barber (pp. 337-346); Adaptability of Control Measures to the Nearctic Fauna of *Anopheles* Mosquitoes, by H. A. Johnson (pp. 353-358); and The Adaptability of Control Measures to the Malaria Vectors of the Caribbean Region, by H. W. Kumm (pp. 359-364).

Observations on the use of "phenol" larvicides for mosquito control, F. L. KNOWLES, W. V. PARKER, and H. A. JOHNSON (*Pub. Health Rpts.* [U. S.], 56 (1941), No. 33, pp. 1637-1641).—Under the conditions of the experiments here considered phenol larvicide (diluted 1 : 30) applied at rates varying from 10 to 95 gal. per acre was less effective than kerosene. In the laboratory, the larvicide applied at the rate of 50 gal. per acre killed 100 percent of fish but only 16 percent of larvae. Because of its low toxicity for larvae and detrimental effect on fish, it does not appear to be a desirable larvicide for general mosquito control.

The genus *Psorophora* in California (Diptera: Culicidae), T. H. G. AITKEN. (Univ. Calif.). (*Rev. Ent.*, 11 (1940), No. 3, pp. 672-682, figs. 3).

The genus *Dioctria* Meigen in North America (Diptera: Asilidae), J. WILCOX and C. H. MARTIN. (U. S. D. A. and Ohio Expt. Sta.). (*Ent. Amer.*, 21 (1941), No. 1, pp. 1-22, pl. 1).—This report of a study of an asilid of the genus *Dioctria* includes descriptions of three new species and five new subspecies. Keys to the three new subgenera and to the seven known species of the genus are included.

An insect pest affecting milk distribution, F. PROCTER (*Dairy Indus.*, 6 (1941), No. 3, pp. 70-71, figs. 3).—*Drosophila busckii*, a fungous fly, found developing in a bottle of milk though very seldom reported in Great Britain, is noted.

The loci of olfactory end-organs in the blowfly *Cynomyia cadaverina* Desvoidy, H. FRINGS. (Univ. Minn.). (*Jour. Expt. Zool.*, 88 (1941), No. 2, pp. 65-93, fig. 1).

The relative resistance of some strains of bitter-gourd to the cucurbit fruit-fly [*Dacus cucurbitae* Coq.], M. FERNANDO and S. B. UDURAWANA (*Trop. Agr. [Ceylon]*, 96 (1941), No. 6, pp. 347-352).

A revision of the North American species belonging to the genus *Pegomyia* (Diptera: Muscidae), H. C. HUCKETT (*Amer. Ent. Soc. Mem.*, No. 10 (1941), pp. [1]+131, pls. 9).—The study here reported records the occurrence of 97 species of *Pegomyia* sens-lat. in North America, of which 69 are recog-

nized as native species, 27 as having first been described from Europe, and 1 from Siberia. A key is given to the groups and to the males and females of the species.

The relative resistance of some cowpea varieties to *Agromyza phaseoli* Coq., M. FERNANDO (*Trop. Agr. [Ceylon]*, 96 (1941), No. 4, pp. 221-224).

Additions au catalogue des Diptères du Québec [Additions to the catalog of the Diptera of Quebec], J. OUELLET (*Nat. Canad.*, 68 (1941), No. 5, pp. 121-141).—The present additions to the earlier lists of Diptera of the Province of Quebec (E. S. R., 69, p. 557) are said to have brought the total number recorded from that province to 2,228 species, representing 64 families and 776 genera.

The introduction of queen bees, L. E. SNELGROVE (*London: Purnell & Sons*, 1940, pp. 205, pls. 11).—A practical work presented in 12 chapters, with a bibliography of four pages.

The influence of stock on production and supersedure, M. C. TANQUARY and M. H. HAYDAK. (Minn. Expt. Sta.). (*Gleanings Bee Cult.*, 69 (1941), No. 10, pp. 613-614).

Some European views on European foulbrood, A. D. BETTS (*Gleanings Bee Cult.*, 69 (1941), No. 8, pp. 494-496).—The present status of knowledge of the etiology of European foulbrood is reviewed.

La avispa del Brasil, G. N. WOLCOTT (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 2, p. [11], fig. 1).—Notes on the wasp *Larra americana*.

The habits of the Eucharidæ, C. P. CLAUSEN. (U. S. D. A.). (*Psyche*, 48 (1941), No. 2-3, pp. 57-69).—This contribution deals principally with the host preferences and habits of the adults and larvae of the hymenopterous family Eucharidæ.

Promising parasites of red scale imported from China, H. COMPERE, S. FLANDERS, and H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 21 (1941), No. 8, pp. 9, 26).—A review of the undertakings that have resulted in the recent importation from South China and successful propagation of the California red scale-inhabiting race of *Comperiella bifasciata*.

Use air transport from China for the introduction into California of a red scale inhabiting *Comperiella*, H. COMPERE, S. FLANDERS, and H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 10, pp. 291, 300-301).—Noted above.

The bite of the black widow spider, A. H. VOSS (*Clin. Med.*, 48 (1941), No. 5, pp. 123-125, fig. 1).—Reports are made of eight cases in which the various forms of treatment for spider bite are described. The only satisfactory results were obtained in the two cases treated with Antivenin. The later use of Antivenin in the treatment of three additional cases is said to have given equally satisfactory results. A new commercial product known as Lyovac Antivenin, supplied in the lyophilized form, namely, dehydrated serum under vacuum, is said to assure therapeutic efficiency for at least 5 yr. The recommended treatment is the injection of 2.5 cc. of the serum as soon as the clinical picture or history indicates that a bite has been received from the black widow spider. Each dose contains the equivalent, in neutralizing power, of the venom of at least 750 spiders.

Control of red spider (*Tetranychus telarius*) by phthalic glyceryl alkyd resin, P. A. ARK and C. M. TOMPKINS. (Univ. Calif.). (*Science*, 94 (1941), No. 2435, pp. 212-213).—The application of a 2-percent solution of phthalic glyceryl alkyd resin in water in combating the common red spider is said to have resulted in rapid destruction. Examination of the ovicidal properties of this insecticide revealed a remarkable efficiency. No injury was observed on plants tested experimentally under greenhouse and field conditions. Concentrations

less than 2 percent (but not less than 1 percent) were effective on adults but not on ova; above 2 percent, the margins of the leaves were burned. A list is given of many plants that have been sprayed with beneficial results and without injury to the leaves. An unidentified species of a very minute white mite occurring on ivy and China asters (*Callistephus chinensis*) and a begonia mite (probably *Avrosia translucens* Nietner) were also successfully controlled by a single application of a 2-percent solution. Since the experiments were performed in commercial greenhouses and in the field, it seems highly probable that this chemical may find a wide application. Additional advantages which it possesses include absence of disagreeable odor, lack of spray residue on the leaves, high degree of spreading capacity, and need of only one application for killing the adults and the ova.

Eriophyid studies, XI, H. H. KEIFER (*Calif. Dept. Agr. Bul., 30 (1941), No. 2, pp. 196-216, figs. 11*).—Reporting further (E. S. R., 84, p. 655), part 1 of the present contribution deals with the blueberry budmite, a survey of which pest was made in North Carolina during May and part of June 1940. It has been described by Keifer⁸ as representing a new species, *Eriophyes vaccinii*. During the last few years this mite has caused a reddish roughening and stunting of the fruit clusters of cultivated blueberry bushes in southeastern North Carolina and in 1939 seriously threatened the crop. Its typical injury to wild plants of the genus *Vaccinium* consists of an unnatural succulence and epidermal roughening or blistering at the bases of the fruit bud scales, causing them to hang in a tight rosette at the base of the fruit stem. The mite feeds and breeds entirely under cover, and the pseudogall is developed to furnish protection and suitable feeding tissue for the young mites. Data at hand indicate that its coastal range is about the same as that of its host plants—from Texas to Florida and north to Maine and Canada. The survey failed to explain the difference in mite damage sustained by the same varieties of cultivated blueberries between southern New Jersey and southeastern North Carolina. The host plant findings indicate that the wild shrubs around the North Carolina plantings, where the injury has been more severe than in New Jersey, are largely *V. australe*, the species from which part or all of the cultivated berries were derived, while in New Jersey such wild infested bushes as were found were *V. astrococcum* and *V. corymbosum*. The hosts and localities of the blueberry budmite as uncovered by the survey are listed, and record is made of the infested *Vaccinium* findings.

In part 2 of the present contribution, four species of *Eriophyes* and one of *Anthocoptes* are described as new. Notes on the occurrence and hosts of these new species are included.

The bulb scale mite, W. E. H. HODSON (*Daffodil Year-Book, No. 11 (1940), pp. 25-28, pl. 1*).

The brown dog tick (*Rhipicephalus sanguineus* (Latreille)) in the role of a household pest in the northern United States, P. C. STONE. (Univ. Mo.). (*Missouri Acad. Sci. Proc., 6 (1941), No. 4, pp. 75-77*).

ANIMAL PRODUCTION

[Animal production studies in the Southern States] (*Assoc. South. Agr. Workers Proc., 42 (1941), pp. 38-39, 43-45, 47-48, 100-101, 106-114, 120-121, 134, 163-164, 214-215, 216-219*).—The following papers giving results of various livestock experiments were presented at Atlanta, Ga., February 5-7, 1941: The Use of Modern Statistical Principles in the Design of Pasture Experiments, by A. E. Brandt (pp. 38-39) (U. S. D. A.); Phosphorus and Calcium in Pasture

⁸ Calif. Dept. Agr. Bul., 28 (1939), No. 5, pp. 328-345, figs. 15.

Fertilization, by F. R. Edwards (pp. 43-44) (Ga. Expt. Sta.); Grain Versus Grass in Beef Production, by R. E. Hunt (pp. 44-45) (Va. Sta.); Utilization of Johnson Grass in a Beef Cattle Program, by K. G. Baker (pp. 47-48) (Ala. Sta.); Management of a Tall Growing Grass, Napier Grass (*Pennisetum purpureum*) for Grazing, by R. E. Blaser, W. G. Kirk, and W. E. Stokes (pp. 100-101) (Fla. Sta.); A Study of the Transmission of Factors Associated With Economy of Gains in Swine, by J. C. Grimes (pp. 106-107) (Ala. Sta.); Record of Performance Work With Swine, by C. I. Bray (pp. 107-109) (La. State Univ.); Factors Affecting Rate of Growth of Lambs During Summer, by J. E. Foster (pp. 109-110) (N. C. Sta.); Wintering Beef Cattle in the Southeast, by W. G. Kirk and R. M. Crown (p. 111); Summary of Beef Cattle Investigations at Jeanerette, Louisiana, by A. O. Rhoad (p. 111) (U. S. D. A.); A Progress Report on High-Phosphorus Vs. Low-Phosphorus Red Clover Hay for Growing Calves, by H. R. Duncan (pp. 111-112) (Univ. Tenn.); Cooperative Beef Cattle and Sheep Research, by J. C. Pierce, Jr. (pp. 112-113) (N. C. Sta.); Problems in the Production of Saddle Horses, by L. J. Horlacher (pp. 113-114) (Univ. Ky.); Classification for Baby Beeves and Cattle Grading Demonstrations in Mississippi, by P. F. Newell (pp. 120-121) (Miss. State Col.); Technique and Problems With Artificial Insemination, by J. P. LaMaster and G. W. Anderson (p. 134) (Clemson Agr. Col.); Feeding Value of Sweet Potatoes; by J. C. Grimes (pp. 163-164) (Ala. Sta.); Factors Influencing Fertility in the Domestic Fowl, by J. E. Parker and B. J. McSpadden (pp. 214-215) (Tenn. Sta.); How Progress Has Influenced Our Poultry Feeding Problems, by H. J. Davis (pp. 216-217) (La. State Univ.); Lespedeza as a Poultry Feed, by R. G. Ringrose (p. 217) (S. C. Sta.); Inducing Hens To Go Broody and Its Application to Small Farm Flock Management, by D. F. King (pp. 217-218); The Effect of Cottonseed Meal When Fed Ad Libitum on Hatchability, by G. J. Cottier (p. 218) (Ala. Polytech. Inst.); and Recent Research on the Endocrine Glands in Poultry, by O. W. Anderson, Jr. (pp. 218-219) (Fla. Sta.).

[Investigations with livestock in Georgia]. (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 31* (1940), pp. 39-76, 77-78).—Results are presented on further work on permanent and summer and winter pastures, kudzu and other grazing crops, and feeding and management of cattle and swine (E. S. R., 83, p. 666).

Research of the New Hampshire Experiment Station in animal breeding and nutrition, E. G. RITZMAN (*New Hampshire Sta. Bul. 331* (1941), pp. 20, figs. 11).—A résumé is presented of a series of experiments in animal breeding and nutrition which has extended over approximately 25 yr. Special emphasis has been laid on the crossing of breeds to produce the multipipple sheep (E. S. R., 70, p. 170) and metabolism studies with cattle, sheep, and horses.

[Livestock production studies by the Texas Station]. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1940*, pp. 40-47, 101-103, 107-110, 143-144, 201-202, 207-208, 239).—Reports by J. M. Jones, B. L. Warwick, S. P. Davis, W. H. Dameron, J. H. Jones, R. E. Dickson, J. K. Riggs, F. E. Keating, W. H. Black, P. E. Howe, J. J. Bayles, L. E. Brooks, R. A. Hall, E. M. Neal, L. H. Tash, E. K. Crouch, N. G. Schuessler, J. H. Quisenberry, F. Hale, C. W. McMath, G. S. Fraps, F. D. Fuller, R. M. Sherwood, J. R. Couch, L. E. James, and I. B. Boughton are given on studies of relation of age to fineness of wool and mohair; vitamin A requirements for beef cattle; milo grain and urinary calculi in beef steers; chopped hegari fodder v. redtop fodder for beef heifers; whole, ground, and chopped alfalfa, Sudan grass, Quadroon heads, and silage with and without molasses and cottonseed cake for fattening lambs; dried citrus peel and pulp for fattening cattle; bonemeal and dicalcium phosphate for beef steers and

cows; dehydrated sweetpotatoes v. shelled corn for fattening beef calves; genetic factors in relation to vitamin A requirements in rats; cottonseed meal, vitamin A, and Ca requirements of swine; Sudan grass pasture and concrete wallows for pigs; fish meal, cottonseed meal, and soybean meal as sources of protein for and vitamin A and D requirements of growing chicks; retardation of chick growth by sulfur; Mn needs of hens and pullets; vitamin A storage in liver of chicks as related to intake; carotene or vitamin A destruction by meat scrap; crude fiber for chicks; Sudan grass grazing or sorgo silage for beef production; and blood Ca and P in range sheep.

Types and market classes of live stock, H. W. VAUGHAN (*Columbus, Ohio: College Book Co., 1941, 21. ed., 4. rev., pp. 607, pl. 1, figs. [368]*).—A revised and enlarged edition of the book previously noted (*E. S. R., 65, p. 60*).

The utilization of the protein of Somerset beans by rats and sheep, D. B. SMUTS, J. S. C. MARAIS, and J. C. BONSMMA (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 15 (1940), No. 1-2, pp. 211-223, figs. 5*).—The biological values of the protein of Somerset beans of 37 and 52 when tested on rats and sheep, respectively, were raised to 54 for rats when 0.2 percent of cystine was added to the ration and to 62 for sheep when fed in equal proportions with corn and to 59 when fed as a supplement to April grazing.

The biological value of the proteins of maize and maize supplemented with lysine and tryptophane, J. S. C. MARAIS and D. B. SMUTS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 15 (1940), No. 1-2, pp. 197-204*).—The biological value of the proteins of white corn was 76 percent, significantly better than the 67 percent for yellow corn. The N utilization of yellow corn was not improved by supplementing it with lysine and tryptophan separately, but was improved to 81 percent when the ration was supplemented with lysine and tryptophan simultaneously. The experiment was conducted with six rats, on rations containing 8 percent of protein, by the methods of Mitchell (*E. S. R., 51, p. 407*).

The biological values of the proteins of oats, barley, wheatbran, and pollard, J. S. C. MARAIS and D. B. SMUTS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 15 (1940), No. 1-2, pp. 205-210*).—The biological values of proteins of oats, barley, wheat bran, and pollard were determined with rats on approximately 8 percent protein rations as 83, 77, 74, and 84 percent, respectively.

The amino acid deficiencies of certain plant proteins and the supplementary effect between plant proteins as measured by means of their biological values, J. S. C. MARAIS and D. B. SMUTS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 15 (1940), No. 1-2, pp. 225-238, figs. 4*).—From studies of biological values of proteins supplemented with amino acids it was found that with rats 0.2 percent of *dl*-methionine increased the N utilization of alfalfa about 30 percent. Cystine gave no benefit as a supplement to peanut meal, although the N utilization of linseed meal was increased about 8 percent. Lysine supplements had no significant effect on the proteins of oats. The biological values of yellow corn and alfalfa and yellow corn and soybeans would have been 64 and 61 percent had there been no supplemental value, but when they were fed in combination the biological values were 80 and 75 percent, respectively. These supplementations are in harmony with the amino acid contents of the proteins of these products.

Chemical substitutes for dietary protein, R. BENESCH (*Nature [London], 147 (1941), No. 3731, pp. 531-534*).—A summary is given of various experiments which have shown the possibilities of substituting amides for part of the proteins in ruminant rations by sources of nonprotein nitrogenous materials, such as ammonium salts, with silage and suitable bacteria.

The excretion of nicotinic acid by rabbits as affected by the amount ingested, P. B. PEARSON and A. H. WINEGAR. (Tex. Expt. Sta.). (*Ztschr. Vitaminforsch.*, 10 (1940), No. 3-4, pp. 238-244, fig. 1; *Fr., Ger. abs.*, p. 244).—The daily urinary excretion of nicotinic acid by rabbits was related to the amount in the feed. On normal rations, rabbits secrete in the urine 773 γ per kilogram of body weight. When a pellagra-producing diet was fed, there was secreted per day 353 γ of nicotinic acid per kilogram of body weight. A method for assaying nicotinic acid in *Herbivora* urine based on the use of cyanogen bromide and aniline is described.

Present knowledge of the nutritional value of grassland herbage, W. M. NEAL. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 666-670).—A brief discussion is given of pastures and green plants as sources of proteins, vitamins, minerals, and feeds for livestock.

A comparison of different crops for grass silage by the use of mason jars as miniature silos, T. E. ODLAND, T. R. COX, and J. B. SMITH. (R. I. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 304-313).—Molasses and phosphoric acid proved satisfactory for the preservation of grass silages under experimental conditions in 2-qt. mason fruit jars. There was a decrease in the protein content of the silage with advancing stages of maturity. Clover, alfalfa, and soybeans made silage with a high protein content and generally excellent quality when harvested at the usual stage of maturity for hay. Other grasses for which the nutrients were reported include alfalfa, clover, timothy, millet, and grass mixtures.

Causes of preferences exhibited by animals for certain inbred lines of corn, E. ROBERTS and I. R. HOENER. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 448-453).—With the choice of two inbred lines and their hybrids, rats preferred Wisconsin R₃ the most, Illinois 90 the least, and R₃×90 (F₂) intermediate. The cause of preference did not appear to be associated with differences in odor of corn, sense of smell in the rat, or in seed coats. Infection of corn by *Diplodia* decreased the preference, which was not increased by the addition of carotene to Illinois 90. The greater liking for R₃×90 (F₁) than for its reciprocal suggested that the cause of preference may be located in the endosperm. Without choice, no significant differences in amounts eaten were found among the three lots. In paired feeding tests, gains on diets differing only in R₃ and 90 did not differ significantly.

The recovery of by-products from poultry evisceration wastes, G. F. STEWART and F. E. MUSSEHL. (Iowa State Col., Univ. Nebr., et al.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 450-453).—A satisfactory meat scrap and salable oil were made by dry-rendering poultry offal. The greatest fat values were obtained from the offal of heavy hens. Chicks receiving a concentrate ration with dried chicken scrap as the protein supplement made a gain of 651 gm. in 56 days. The comparable gains with meat scrap or a commercial mixture of meat scrap, fish meal, and soybean meal as the protein supplements were 603 and 618 gm., respectively.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 473 (1941), pp. 63).—The usual report (E. S. R., 84, p. 798) of the guaranties and analyses of 1,825 feeds officially collected in Vermont in December 1940 is presented with an article on the role of minerals in stock feeding.

Cattle feeding in southern Florida, R. W. KIDDER and W. G. KIEK (*Florida Sta. Bul.* 360 (1941), pp. 23, figs. 3).—There was little difference in the gains or the feed required per unit of gain in three yearly trials with steers comparing fresh sugarcane and sugarcane silage, with and without molasses. Lots on Dallis grass pasture with ground snapped corn and cottonseed meal made slightly

higher rates of gain, and slightly less concentrates were required per unit of gain than when fresh sugarcane or sugarcane silage was fed. Considerably smaller amounts of steamed bonemeal, "salt sick" mineral, and common salt were consumed on the pasture than in the dry-lot feeding. The general principles of feeding and fattening beef cattle in southern Florida are presented.

Factors influencing rate of gain of beef calves during the suckling period, B. KNAPP, JR., and W. H. BLACK. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 4, pp. 249-254).—A study by variance of the factors influencing rate of gain in calves showed that milk consumption had the greatest influence, followed in order by hay and grain. The combined influence of these three variables account for 41 percent of the variation in the rate of gain during the suckling period. The analysis of variance indicated that differences in the rate of gain of the progeny of different sires could not be demonstrated during the period prior to weaning. Further, there was little relation between rate of gain before and after weaning. The investigation was based on a study of various factors in their relation to gain in 58 beef calves at Beltsville and 180 at Miles City, Mont.

Possible rôle of carabao in the meat packing industry in the Philippines, M. D. SUMULONG (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 3, pp. 295-312).—The lean meat of carabao carcasses was shown to compare favorably in chemical composition with that of cattle. Comparative tests of the dressing and use of carabao in the preparation of cured products suggested that carabao could be very well used for beef in the canning of many products, as there was no appreciable difference in these products except for the somewhat coarser bundles of the muscle fibers from carabao. For leather and other byproducts carabao seemed serviceable.

The reproductive capacity of breeds of range sheep, K. RASMUSSEN (*Sci. Agr.*, 22 (1941), No. 1, pp. 11-17).—Significant differences in prolificacy were noted between the Dominion Experimental flocks at Lethbridge, Alberta, Canada, of New Zealand and Canadian Corriedales, purebred and grade Rambouillets, F₁ crossbreds, and backcrosses of F₁s to Corriedales. Breed and strain differences in breeding records of 2,777 ewes are recorded.

Supplementation of winter grazing in the Transvaal with special reference to the maintenance protein requirement of sheep, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 15 (1940), No. 1-2, pp. 187-196).—In metabolism experiments with mature and young sheep, 81 gm. of yellow corn was found to supplement adequately the protein of April grazing. Energy requirements must be satisfied, as observed in experiments with corn, peanut meal, urea, and starch as supplements to April and July grazing.

Summer fattening of farm flock lambs (*North Dakota Sta. Bul. 306* (1941), pp. 11, fig. 1).—Comparisons during 3 yr. showed weaning and feeding purebred Hampshire, Shropshire, and Southdown lambs to be a satisfactory method of handling Northwest farm flock lambs in the late summer. Creep feeding the lambs on pasture with their dams in the late summer did not prove as satisfactory as dry-lot feeding. The highest average daily gains during the late summer of 0.35 lb. were made by lambs receiving a ration of 45 percent oats, 45 percent barley, 5 percent bran, and 5 percent linseed meal.

Fattening western lambs and gummer ewes, J. C. WATSON and F. U. FENN (*South Dakota Sta. Bul. 354* (1941), pp. 11, fig. 1).—Three years' comparisons of rations containing ground and whole corn and barley with alfalfa hay for ewes and lambs showed that lambs required smaller amounts of feed per unit of gain than the ewes. Mortality of the ewes was greater than that of the lambs.

Average daily gains per head were 0.30, 0.28, 0.35, and 0.34 lb. in the ewes on the whole barley, ground barley, whole corn, and ground corn rations, respectively. The whole grains produced average daily gains of 0.32 and 0.34 lb. in the lambs. Corn as a fattening feed was more efficient than barley, and the animals receiving corn were more uniform at finishing. Quality and vigor determined the death losses occurring in the ewes. The roasted mutton from five representative fat ewes from each lot compared favorably with that from lambs. Grinding did not prove profitable, even for gummer ewes, because of the reduction in palatability.

Animal nutrition: Recent contributions in swine nutrition, B. W. FAIRBANKS and E. CURZON. (Univ. Ill.). (North Amer. Vet., 22 (1941), No. 1, pp. 28-31).—A summary is given of investigations on nutrient requirements of swine with special reference to proteins and vitamins.

Lipids of the duodenal mucosa of swine during fat absorption, R. REISER (Jour. Elisha Mitchell Sci. Soc., 56 (1940), No. 2, pp. 221-222).—Scrapings of the mucosa of swine receiving cottonseed oil mixed with a standard feed were found to contain 4.5 percent of free fatty acids, as contrasted with 2.5 percent in scrapings from the mucosa of the intestine of fasting animals. About 1 to 3 percent of triglyceride fatty acid was found in the scrapings after absorption from six of nine animals, but practically none was found in the fasting animals.

Use of the penetrometer for determining the firmness of fatty tissue of hog carcasses, R. L. HINER and O. G. HANKINS. (U. S. D. A.). (Jour. Agr. Res. [U. S.], 63 (1941), No. 4, pp. 233-240, figs. 3).—The limits of penetration in millimeters during 15 sec. of a needle of 0.15-in. diameter and weighing 255.65 gm. into the chilled back fat of pork of five grades at from 33° to 35° F. were established as hard, 2.1 or less; medium hard, 2.2 to 3.3; medium soft, 3.4 to 4.8; soft, 4.9 to 7.0, and oily, 7.1 or more. The penetrometer determinations were made on the back fat after 72 hr. of chilling. The correlation between the penetrometer determinations and committee ratings were over -0.9. Correlations of the committee grade and penetrometer readings with refractive index were equally high.

Importance of choline in synthetic rations for dogs, A. E. SCHAEFER, J. M. MCKIBBIN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (Soc. Expt. Biol. and Med. Proc., 47 (1941), No. 2, pp. 365-368, fig. 1).—In addition to thiamin, riboflavin, nicotinic acid, pyridoxine, and pantothenic acid, choline was found to be required by puppies on a synthetic diet. Additions of 50 or 100 mg. of choline per kilogram of body weight per day caused marked increases in the weight of puppies in which growth had reached a plateau on synthetic rations. The requirement of choline was supposed to be dependent on the amounts of methionine and cystine, and differences in the choline requirements on rations containing varying amounts of casein are thus explained.

Hypervitaminoses D₂ and D₃ in dogs as affected by vitamin A, A. F. MORGAN, J. B. HENDRICKS, and R. M. FREYTAG. (Univ. Calif.). (Jour. Biol. Chem., 140 (1941), No. 1, pp. XCII-XCIII).—The administration of 10,000 units of vitamin D per kilogram per day in irradiated ergosterol or Delsterol proved highly toxic to young dogs. When administered as tuna-liver oil, less harmful effects were evident. Excess vitamin A proved beneficial, but no repair of the damage to the teeth occurred.

Riboflavin deficiency in the dog, A. E. AXELROD, M. A. LIPTON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (Amer. Jour. Physiol., 133 (1941), No. 3, pp. 555-561, fig. 1).—Young dogs on riboflavin-deficient rations made poor growth, and by the end of the third week growth had ceased entirely. Supplementing the deficient ration with 100, 200, and 400 µg. of riboflavin per 100 gm. of ration

showed that 200 μ g. was a minimum level but 400 μ g. per 100 gm. of ration permitted normal growth. A decrease in blood riboflavin and urinary excretion was found in acute stages of riboflavin deficiency.

Further observations of riboflavin deficiency in the dog, H. R. STREET, G. R. COWGILL, and H. M. ZIMMERMAN (*Jour. Nutr.*, 22 (1941), No. 1, pp. 7-24, figs. 2).—Dogs exhibiting neurological abnormalities and profound collapse on riboflavin-deficient diets⁶ showed demyelination of the peripheral nerves and the posterior columns of the spinal cord. Administration of crystalline riboflavin prevented these abnormalities or, if they had occurred, restored the normal condition.

Poultry activities of the United States Department of Agriculture, J. R. MOHLER ET AL. (*U. S. Dept. Agr.*, 1941, pp. [3]+64).—A condensed compilation, prepared by the Departmental Poultry Committee, is given of the various lines of poultry work carried on by the various units of the Department.

Blood cells in the bone marrow of the chick before and after hatching, B. R. BURMESTER, J. M. SEVERENS, and E. ROBERTS. (Univ. Ill.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 391-394, fig. 1).—Differential counts of blood cells in the circulation and bone marrow of chicks from the fifteenth day of incubation to the seventh day after hatching showed that the cells in the long-bone marrow increased rapidly after hatching. At about the twentieth day of incubation and during the rest of the period investigated the red cells in the circulation averaged about 2½ million per cubic centimeter. The proportion of white cells was greatly increased as development progressed.

Some factors influencing shank and skin color in the growing chicken, J. C. HAMMOND and H. M. HARSHAW. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 437-444, figs. 2).—The quantity of yellow color in the shank and skin of the yellow-skinned breeds was found to depend upon the interaction of the breed, the quantity of yellow pigment consumed, the pigment-suppressing factor in the ration, and probably upon other factors. Fortified cod-liver oil was a particularly potent source of the pigment-suppressing factor. It was present at about half the strength in ordinary cod-liver oil and in still lesser amounts in sardine oil. Heating cod-liver oil in vacuum for 3 hr. at 230° C. removed a large part of the pigment-depressing effect. These conclusions were derived from six experiments in which groups of 40 chicks were fed for 6 weeks or more to ascertain color changes in the shank or skin when different rations and supplements were provided. It is of note that the level of cod-liver oil feeding was several times that needed for vitamin D protection.

Effect of certain protein supplements in inhibiting pigment deposition in growing chicks, T. G. CULTON and H. R. BIRD. (Md. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 432-436).—Additions of approximately 15 percent of meat scrap, fish meal, or soybean meal to the ration of chicks in four experiments were found to reduce the amount of yellow pigment in the shanks at from 4 to 10 weeks of age. Weights and color determinations with the Heiman and Carver color rotor (E. S. R., 75, p. 243) were ascertained at weekly intervals. Variation in the color inhibition was noted between different lots of the same brands of menhaden meal and soybean meal. The inhibiting effects appeared to be maximal when the chicks were 4 to 5 weeks old but were less marked at 9 to 10 weeks of age.

The carbohydrate component of the rice factor, E. L. R. STOKSTAD, H. J. ALMQUIST, E. MECCHI, P. D. V. MANNING, and R. E. ROGERS. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 373-375).—In further experiments

⁶ Amer. Jour. Physiol., 125 (1939), No. 2, pp. 323-334.

(E. S. R., 83, p. 812) it was found that growth in chicks was stimulated by adding the following substances to a basal diet: Gum arabic, sodium alginate, *d*-xylose, *d*- and *l*-arabinose, glucuronic acid, calcium gluconate, and galactonic lactone. These substances served as the carbohydrate component of the rice factor for the chick.

Incidence of gizzard erosion, T. B. CHARLES, J. H. GILLESPIE, R. C. DURGIN, and C. L. MARTIN. (N. H. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 447-449).—The incidence of gizzard erosion in 715 chicks hatched under uniform conditions from eggs obtained from 22 State experiment stations was high. Only 28 gizzards of both sexes were normal. Gizzard erosion seems widespread without regard to breed or environmental conditions.

Effect of milk on gizzard erosion and cholic acid in the chick, H. J. ALMQUIST, E. MECCHI, and F. H. KRATZER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 525-526).—Nutritional gizzard erosion was further linked with a deficient formation of bile, especially of cholic acid, within the chick. Supplementing with milk products a basal ration normally causing gizzard erosion in chicks (E. S. R., 81, p. 409) showed no effect of dried milk on gizzard erosion, but fresh and boiled whole and skim milk restricted the severity of this condition. The cholic acid present in the bile was much increased.

Choline in the nutrition of chicks, D. M. HEGSTED, R. C. MILLS, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 459-466).—The newly hatched chick requires choline for normal growth. Supplementing a basal ration which produced inferior growth and perosis with 0.05 percent of choline prevented the occurrence of perosis, but 0.1 percent of choline was required to give normal growth in chicks. There were tested in these experiments such supplements as liver and kidney extracts, yeast, and pantothenic acid to the basal rations of newly hatched chicks up to 4 weeks of age. Additions of cartilage and casein actually inhibited growth. Choline-deficient chicks did not show fatty livers, and bone phosphatase values were normal in chicks exhibiting perosis on a choline-deficient ration.

Inositol in chick nutrition, D. M. HEGSTED, G. M. BRIGGS, R. C. MILLS, C. A. ELVEHJEM, and E. B. HART. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 376-377).—Varying growth responses from 18 to 52 gm. were induced in 4 weeks in chicks by the addition of 0.1 percent of inositol to several simplified chick rations similar to those used in previous investigations (E. S. R., 83, p. 533) with additions of known essentials.

Methionine in the diet of the chick, A. A. KLOSE and H. J. ALMQUIST. (Univ. Calif.). (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 467-469).—Chicks 1 week of age were found to require at least 1 percent of methionine as a supplement to a basal ration, but it appeared that homocystine and choline together effectively replaced methionine in the diet of the chick. There was a linear relation to the amount of choline added. Creatine evidently could not replace methionine in the diet of the chick. Thus the choline-homocystine-methionine diet established for the rat, noted by Du Vigneaud et al. (E. S. R., 84, p. 274), holds for the chick as well.

The absorption and retention of carotene and vitamin A by hens on normal and low fat rations, W. C. RUSSELL, M. W. TAYLOR, H. A. WALKER, and L. J. POLSKIN. (N. J. Expt. Stas.). (*Jour. Biol. Chem.*, 140 (1941), No. 1, p. CIX).—Although the hen on a low-fat ration was not able to absorb carotene as efficiently as on a normal ration, vitamin A was absorbed equally well on a normal or on a low-fat ration. Even with a high-vitamin A ration the livers of birds on a low-fat ration contained only about one-eighth as much vitamin

A as normals. This finding is thought to indicate that a substance removed with the fat of the ration is necessary for vitamin A retention.

Shrunken wheat for laying hens, G. P. GOODEARL (*North Dakota Sta. Bul. 297* (1941), pp. 10).—Shrunken wheat with a test weight of 40 lb. per bushel was not inferior to plump wheat for laying hens in 3 years' trials. In these tests the shrunken wheat was used whole or ground in the mash and in the scratch with virtually no differences in feed consumption and incubation. However, slightly less shrunken than plump wheat was consumed.

Coarse mashes more desirable for laying hens, B. ALDER (*Farm and Home Sci. [Utah. Sta.], 2* (1941), No. 3, p. 2).—When a coarser mash was fed to White Leghorns over a 5-yr. period, egg production was higher and mortality was lower than when finely ground mashes were employed.

High altitude incubation of eggs, M. O. NORTH. (Wyo. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 3, pp. 158-159, 184).—The hatchability of eggs was 92 percent when humidity was maintained at 75 percent from before the egg was pipped to hatching, as contrasted with 84-percent hatchability of eggs incubated at 60-percent humidity. Reduced amounts of ventilation at high altitudes were also beneficial for hatchability because of a reduction in cooling due to excess evaporation.

The importance of length of incubation period in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul. 384* (1941), pp. 12).—Study of 4,730 chicks produced by eggs from 430 Rhode Island Red hens showed that the mortality rate during 6 mo. increased as the length of the incubation period increased. There was a consistent decline in annual egg production as the incubation period increased. There was no conclusive evidence that the factor governing length of the incubation period was inherited, but the early-emerging pullets were likely to be earlier in sexual maturity than those emerging later.

Development of homeothermy in birds, A. L. ROMANOFF. (Cornell Univ.). (*Science*, 94 (1941), No. 2435, pp. 218-219, fig. 1).—It is shown that the time of occurrence of homeothermy in the chicken begins early in its development, but the rise was periodic with declines at the ninth or tenth and fifteenth or sixteenth days of incubation. True homeothermy was not acquired until the fourth or fifth day after hatching.

A progress report from Canada of research on breast blisters, G. C. HODGSON and H. S. GUTTERIDGE (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 3, pp. 150-155, 192).—Study of breast blisters developed at the Dominion Experimental Farms, Ottawa, showed that the size and numbers of breast blisters were not influenced by age at which roosting starts, kinds of roosts, depth of litter, or weight of the birds. Blisters were increased in battery rearing and sex and breed differences were observed, but the mode of inheritance was complex. There were ranges of from 0 to 75 percent in the proportions of sons of 18 sires which showed blisters. The numbers and size of such blisters were highly variable.

The influence of restricted food intake on the reproductive performance of breeding turkeys, H. M. SCOTT and L. F. PAYNE. (Kans. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 395-401, figs. 4).—The maintenance of weight by restricting the ration of turkey breeders to 61 and 78 percent of the consumption of those without restrictions during the nonlaying season, with full feed thereafter, did not alleviate losses or improve hatchability. The birds on restricted rations increased in weight during the first 3 weeks of the laying season, although during the egg laying season the female turkey decreases approximately 18 percent in live weight. The more restricted ration significantly reduced the hatchability of fertile eggs.

Turkey feeding, G. P. GOODEARL and F. E. MOORE (*North Dakota Sta. Bul. 303 (1941), pp. 22, figs. 2*).—Results of two experiments conducted in 3 yr. each with 1,152 and 1,209 poult, respectively, are reported. In one group, proso millet replaced yellow corn in part and completely in the mash and grain rations. Better growth was induced in both ♂s and ♀s, but slightly more feed was required when proso millet was substituted for the corn. The average live weight at 26 weeks of age by birds receiving from 24 to 34 percent of yellow corn in the mash ration and 50 percent in the grain ration was 14.8 lb., as compared with 15.1 and 15.8 percent, respectively, when half or all of the corn was replaced by proso millet. The grade of millet-fed birds excelled that of corn-fed birds and there was evidence of a lower percentage of pinfeathering, although more feed was required per unit of gain.

In another group of experiments, poult which received the mash in the form of pellets were heavier at 4 weeks of age and continued to be heavier throughout a 26-week feeding period than birds receiving the mash in an unpelleted form. At first there was some trouble in getting poult to eat pellets, but total feed consumption during the first 8 weeks was greater where pellets were fed than on dry mash alone. With pellets there was an average of 4.9 lb. of feed required per pound of gain, as contrasted with 5.2 lb. of dry mash. The pellet-fed birds graded better and showed less evidence of pinfeathering than birds fed dry mash.

Turkey capons, G. P. GOODEARL and F. E. MOORE (*North Dakota Sta. Bul. 307 (1941), pp. 18, figs. 3*).—Caponization of late-hatched poult at 8 weeks of age did not prove of value in increased rate or efficiency of growth as compared with toms. The capons gave results very similar to those with toms in mortality during the growing period. Differences in growth rate did not warrant holding capons beyond 28 weeks of age. Weights and skeletal and fleshing measurements of capons and toms hatched in the normal season did not show significant differences to 26 weeks of age. The feed consumption was similar, although toms made more effective use of feed. Capons graded a little higher but had to be sold as other toms. Six capons kept until 54 weeks of age resembled toms when alive and when dressed.

DAIRY FARMING—DAIRYING

Dairy production milestones, W. E. KRAUSS. (Ohio Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 723-733).—A paper presented before the thirty-sixth annual meeting of the American Dairy Science Association at Burlington, Vt., June 24, 1941 (E. S. R., 85, p. 432).

[**Dairy investigations in Texas**] (*Texas Sta. Rpt. 1940, pp. 103-104, 105-107*).—Progress reports (E. S. R., 84, p. 806) are presented for the following studies, made by O. C. Copeland, G. S. Fraps, A. L. Darnell, C. N. Shepardson, F. E. Hanson, and T. R. Freeman: The quantitative requirements of vitamin A for dairy cattle, dehydrated sweetpotato meal v. ground shelled corn for lactating dairy cows, milk substitute v. skim milk for dairy calves, legumes v. nonlegume dry roughages for dairy cattle, factors affecting the hardness of butter, the effect of various temperature exposures on the quality of southern short-cure Cheddar cheese, and variations in normal composition of milk produced in the State.

Cows' urine as a fertilizer for bluegrass pastures, W. B. NEVENS. (Ill. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 761-769, figs. 2).—Five comparable plots (2 by 2 rods in size) laid out in a well-sodded bluegrass pasture were used. Applications of fresh cow urine were made in April, May,

and June 1939, and in May and June 1940. Rates of application were 0, 1,250, 2,500, 3,750, and 5,000 lb. per acre on plats 1 to 5, respectively. The heavy applications were, as a rule, not harmful to the forage. Analyses of weed-free samples of herbage collected at approximately monthly intervals showed that the protein content of the grass from the treated plats was higher than that of the control area, and in most instances the higher the rate of urine application the higher was the protein content. The effect of the first year's application on protein content of the grass was evident throughout the remainder of that season and in May of the following year. The yields of grass were increased by these applications, with a tendency toward higher yields from the more heavily treated plats. The greater intensity of grazing on the treated plats indicated an increase in palatability as a result of applying the urine.

Grass silage on Massachusetts dairy farms, C. R. CREEK (*Massachusetts Sta. Contrib.* 378 (1940), pp. [21]+17).—“This report deals with the kind of crops grown for grass silage in different areas of the State, the acreage and yield of these crops, the amount of labor and equipment needed, and the various uses of this type of feed. Farmers' opinions are given on the advantages and disadvantages of grass silage. A comparison is included of the relative weight of grass and corn silage.”

How fine should grain be ground for milk cows? G. C. WALLIS and T. M. OLSON (*South Dakota Sta. Cir.* 34 (1941), pp. 7, figs. 2).—This popular publication briefly summarizes the results of a series of digestion trials with cows, comparing the utilization of whole, medium-ground, and fine-ground corn and oats. Medium grinding and fine grinding were accomplished by using a $\frac{1}{16}$ -in. and a $\frac{1}{32}$ -in. screen, respectively, in a hammer mill. In each case the grain was fed in combination with alfalfa hay, in equal parts by weight. Assuming a constant value for alfalfa in all cases, an equivalent amount of nutrients was provided in 119.3, 100, and 96.2 lb. of whole, medium-ground, and fine-ground corn, respectively, and in 105.1, 100, and 103.3 lb. of whole, medium-ground, and fine-ground oats. It is concluded that from the standpoint of food value obtained, palatability, cost, and ease of mixing and handling the medium grinding of grain, which is just sufficient to break up the kernels into several portions, is the best practice in preparing grain for dairy cows.

Effects which selection of dams may have on sire indexes, J. L. LUSH, H. W. NORTON, III, and F. ARNOLD. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 695-721, figs. 2).—The results of two studies are reported, the first, an analysis of 676 dam-daughter comparisons used in proving 103 sires in Iowa dairy herd improvement associations, and, the second, an analysis of 3,010 dam-daughter comparisons, including 209 sires with six or more daughters as reported in the Herd Improvement Registry of the Holstein-Friesian Association. Results of these studies agree in showing that when the dams were segregated in a high and low half on the basis of their first record, the difference between the average production of the two groups was more than twice as great as the difference between the average of later records of the same groups. It is emphasized that the major source of error in estimating the breeding worth of cows or in interpreting the progeny test of bulls from production records is in environmental circumstances, known and unknown, which may make one record higher or lower than another even for the same cow kept for another lactation under what are intended to be the same conditions. The sources of variance in single records are estimated to be as follows: Temporary variations in environmental conditions 57-60 percent, permanent but nontransmissible differences between cows 10-15 percent, and hereditary dif-

ferences between cows 25-30 percent. It is shown that differences in the intensity with which the mates of different sires are selected would bias sire proof, especially the daughter-dam difference and to a lesser extent the index and the daughter average. The use of lifetime averages automatically corrects for much of the bias which in selected groups exists between the records on which they were selected and their real abilities. Daughters whose dams were untested can be included in sire indexes by using the herd average in place of the record of each such dam. Such procedure is more likely to improve than to lower the accuracy of the index, although there is some risk of the latter.

List of sires proved in dairy herd improvement associations, 1941 (*U. S. Dept. Agr., Misc. Pub. 453 (1941), pp. 263*).—This publication, the fifth of the series (*E. S. R.*, 84, p. 97), contains the names and summarized records of 3,519 sires whose records were tabulated between April 1, 1940, and April 1, 1941.

Menstruation frequency and its relation to conception in dairy cattle, G. W. TRIMBERGER. (*Nebr. Expt. Sta.*). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 819-823).—Four groups of dairy animals, including 100 heifers and 100 cows not bred and comparable groups which were bred, were observed at frequent intervals after oestrus for external evidence of menstruation. Of the animals not bred 100 percent of the heifers and 61 percent of the cows showed evidence of menstruation. Among the bred heifers 81 percent menstruated, while of the 61 percent which conceived 85.25 percent showed evidence of menstruation as compared with 74.86 percent among those not conceiving. Among the bred cows 72 percent conceived, of which 69.44 percent also menstruated as compared with 39.29 percent among those not conceiving. No definite relationship between breeding and conception as affecting menstruation could be established on the basis of these data. Among all animals with external evidence of menstruation, 74.26 percent showed this discharge on the second day following oestrus.

Live weight of cow at various stages of lactation in relation to milk-energy yield, W. L. GAINES. (*Ill. Expt. Sta.*). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 795-797).—In a further study of the relation of milk-energy yield to live weight of dairy cows (*E. S. R.*, 84 p. 385), 11 records of Holstein cows were fitted to the equation $FCM = aW^b$, in which FCM is milk-energy yield for the first 8 mo. of the lactation and W is live weight measured successively at monthly intervals during the lactation period. It was found that the value of the exponent b varied widely with the stage of lactation at which live weight was measured. Where live weight was taken during the first month of lactation, the value of b was 1.07, increasing to a maximum of 1.49 when measured at the fourth month, and then decreasing to a minimum of 0.28 when it was recorded in the ninth month. Thus it appeared sound to measure lactation performance of the cow in terms of FCM/W , i. e., milk-energy yield for the first 8 months' partial lactation per unit of live weight in the first month of lactation, which confirms an earlier conclusion (*E. S. R.*, 78, p. 241).

Utilization of glycoprotein of the blood plasma by the lactating mammary gland, E. P. REINEKE, M. B. WILLIAMSON, and C. W. TURNER. (*Mo. Expt. Sta.*). (*Jour. Biol. Chem.*, 138 (1941), No. 1, pp. 83-90).—Lactating, nonlactating pregnant, and nonlactating nonpregnant goats were used in this investigation. Arterial and mammary venous blood samples were drawn while the animals were under nembutal anesthesia, as described elsewhere (*E. S. R.*, 85, p. 523). By means of arteriovenous blood differences it was evident that the mammary gland utilizes glycoproteins of the blood plasma. The average uptake of glycoprotein by the lactating gland was 2.15 mg. per 100 cc. of plasma as compared with 0.58 and 0.83 mg., respectively, by the nonlactating pregnant and nonlactat-

ing nonpregnant goats. Since glycoproteins of the blood are present only in the globulin fraction, it seemed evident that the plasma globulins are concerned in the synthesis of milk protein. There was no evidence of uptake of amino acids by the mammary gland, thus providing further evidence that free amino acids are not the major precursors of the protein in milk.

The utilization of β -hydroxybutyric acid by the lactating mammary gland, J. C. SHAW and C. B. KNOTT. ([Conn.] Storrs Expt. Sta.). (*Jour. Biol. Chem.*, 188 (1941), No. 1, pp. 287-292).—Both lactating and nonlactating cows were included in this study. Arterial and mammary venous blood samples were obtained by the method of Shaw and Petersen (*E. S. R.*, 82, p. 672). On the basis of arteriovenous blood differences it was ascertained that in lactating cows there was a consistent utilization of blood acetone bodies by the active mammary gland, whereas the mammary gland of nonlactating cows did not use a measurable quantity of acetone bodies. Fractionation disclosed that this utilization by the active gland is confined to β -hydroxybutyric acid, the rate of uptake of this fraction averaging 2.49 mg. percent. The data indicated that the β -hydroxybutyric acid may be the precursor of the short chain fatty acids in milk. If it is assumed that this product is used entirely for energy purposes, approximately 42 percent of the total oxygen consumption of the secreting gland would be due to the burning of β -hydroxybutyrate.

Pre-milking of heavy producers, H. P. DAVIS and G. W. TRIMBERGER. (Univ. Nebr.). (*Holstein-Friesian World*, 38 (1941), No. 8, pp. 7-8).—Preparturition milking of heavy-producing cows was practiced on about 160 individuals, including representatives of the Holstein, Ayrshire, Jersey, and Guernsey breeds. The milking was started at about 7 days before calving. Holsteins, on the average, yielded about 3 lb. of milk on the seventh day and over 22 lb. of milk 1 day before calving, while the other breeds averaged about $\frac{1}{2}$ lb. and over 10 lb. at comparable periods. Swelling, inflammation, and physical strain on the udders were greatly reduced by this practice, while no undesirable effects on the cows were apparent. Calves receiving milk from cows which had been premilked were more subject to nutritional disorders and experienced a much higher rate of mortality than those receiving normal colostrum. The holding of colostrum in frozen storage from cows which were not premilked appeared to offer a solution for this problem since the frozen colostrum could be thawed and successfully fed to young calves from the premilked dams.

Final report of committee on methods of determining the curd tension of milk, F. J. DOAN ET AL. (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 825-827).—This report of the committee of the American Dairy Science Association describes the equipment, reagents, and procedures approved by the parent association in the interest of standardizing the testing method.

Studies on the copper content of the milk of sheep and of cows, A. B. BECK (*Austral. Jour. Expt. Biol. and Med. Sci.*, 19 (1941), No. 2, pp. 145-150).—Data are presented on the copper content of the blood and milk of sheep and cows, a part of which had access to forage of normal copper content (approximately 10 p. p. m.), while others were confined to pastures very low in copper. Among the ewes having access to normal pasture the copper content of the milk ranged from 0.20 to 0.64 mg. per liter in early lactation, declining to 0.04 to 0.16 mg. per liter in late lactation. Milk from the normally fed cows generally contained between 0.05 and 0.20 mg. of copper per liter. The trend toward decreasing copper in the milk with advance of lactation was observed in some cows, but not in others. No correlation was observed between blood copper levels and the variations in milk copper. Both the sheep and cows on copper-deficient pastures produced milk relatively very low in copper, values generally falling within a range of from 0.01 to 0.02 mg. per liter.

Manganese in cows' milk, J. G. ARCHIBALD. (Mass. Expt. Sta.). (*Milk Plant Mo.*, 30 (1941), No. 9, p. 36).—In a reversal feeding experiment of 6 months' duration, one group of four cows (one each of Ayrshire, Guernsey, Holstein, and Milking Shorthorn) received a standard dairy ration, while a comparable group received in addition to the basic ration a daily supplement of manganese in the form of the sulfate. The average manganese content of the milk based on analyses of monthly samples was 23.6 μg . per liter from the unsupplemented group and 46.2 μg . for the supplemented group. These average differences are considered highly significant in view of the fact that in every instance the manganese content of the milk from a cow receiving the supplement was greater than that of her breed mate receiving no supplement. The significance of these findings from the standpoint of nutritional properties and keeping quality of the milk is being further investigated.

Untersuchungen über den Karotingehalt der Milch (Investigations of the carotin content of milk), W. EHRSTRÖM (*Skand. Vet. Tidskr.*, 31 (1941), No. 7, pp. 385-407; *Eng. abs.*, p. 404).—The author has investigated the carotene content of a special grade of milk sold in Helsinki (Helsingfors) under the name of "control milk." The carotene values in the milk from 26 herds at various seasons of the year in most instances exceeded 0.15 mg. of carotene per liter. It is concluded that the feeding practices followed in producing control milk have resulted in a product of high biological value. The point is stressed that year-round feeding must be so regulated that the amount of carotene in milk is held relatively constant. To attain this it is recommended that the cows receive a minimum of 0.8 kg. of A. I. V. fodder daily per liter of milk produced.

Butterfat and silage carotenoids, B. C. JOHNSON, W. H. PETERSON, and H. STENBOCK. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 813-817, fig. 1).—By means of spectrographic analyses, a detailed study of the types of carotenoid pigments imparted to milk by feeding various forms of plant herbage revealed that 80 percent of the milk pigment consisted of carotene when cows were on pasture as compared with 68 and 65 percent when alfalfa-molasses silage and alfalfa-phosphoric acid silage, respectively, were fed. Thus it appeared that certain noncarotene pigments formed by the action of acids in silage are carried over into the milk fat.

Heat-resistant and heat-loving bacteria, W. B. SABLES. (Univ. Wis.). (*Milk Plant Mo.*, 30 (1941), No. 8, pp. 32-33, 42).—Information is included on the sources of heat-resistant and heat-loving bacteria in milk, methods of control in the milk plant, the prevention of contamination and growth, and detection of these types of organisms in milk. The method of Myers and Pence (*E. S. R.*, 85, p. 661) and the Burri smear technic are recommended for the detection of thermoduric organisms in milk, while the direct microscopic examination and the methylene blue test (at 122°-125° F.) are considered effective in detecting thermophiles.

Thermoduric bacteria in milk.—III, The effect of changing agar and temperature of incubation for plate counts on the problem of thermoduric bacteria in milk, J. L. HILEMAN, C. MOSS, and B. STEAD (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 799-806).—Continuing this series (*E. S. R.*, 85, p. 525), 100 lots of mixed milk were subdivided for pasteurization as follows: (1) In a standard vat at 143° to 144° F. for 30 min., (2) in the laboratory at 143° to 144° for 35 min., and (3) in the laboratory at 160.5° to 161.5° for 16 sec. Samples of the raw and pasteurized milks were plated on the old standard agar and on the new standard medium (tryptone glucose extract milk agar), each at incubation temperatures of 37° and 32° C. In all cases, lowering the incubation temperature or changing from the old to the new medium, or making

both changes simultaneously, resulted not only in higher bacterial counts on both raw and pasteurized milk but also in a higher percentage of the organisms counted in raw milk being classified as thermoduric. The significance of these findings in relation to the enforcement of standards for bacterial counts in market milk is discussed.

Sources of hemolytic enterococci found in milk, G. E. TURNER and F. R. SMITH. (Univ. Calif.). (*Jour. Milk Technol.*, 4 (1941), No. 4, pp. 183-186).—Using methods of isolation, as described, hemolytic enterococci were obtained from cow feces, from water and soil, and from the udder of an apparently normal cow. Physiological reactions are indicated for strains of *Streptococcus zymogenes* from feces, a cow's udder, and water, and of strains of *S. durans* from feces and soil. Failure of *S. durans* to ferment sucrose, glycerol, mannitol, and sorbitol provided a means of clearly differentiating between these two species.

The detergent efficiency of soda ash, wood ash, and mud on brass and tinned steel milk utensils, H. C. VERMA, D. L. PAUL, and Z. R. KOTHAVALLA (*Indian Jour. Vet. Sci. and Anim. Husb.*, 11 (1941), No. 1, pp. 33-37).—In this series of comparisons, the control milk utensils were scrubbed with sterilized coconut coir only, rinsed with water, and dried in the sun for 30 min., while other utensils were treated similarly using soda ash, wood ash, and mud, respectively, as cleaning agents. The bacterial count of the utensils cleaned with soda ash were consistently lowest, followed closely by the wood ash group, while mud, although less effective than either ash, showed a considerable effect in lowering the bacterial count. The brass utensils averaged much lower in bacterial content than the tin ones, evidently due to the bactericidal action of the brass or copper.

Sanitary regulations for controlling the production of paper containers for milk, C. N. STARK. (Cornell Univ.). (*Jour. Milk Technol.*, 4 (1941), No. 4, pp. 200-205, figs. 2).—A brief review, in which it is concluded that a determination of the number of living bacteria per gram of disintegrated board measures satisfactorily the conditions under which the paper board was produced; that the rinse test is a satisfactory measure of storage and handling after the containers are formed; and that the methods employed in the manufacture of paper containers for milk are such that the possibility of a public health problem connected with their use is remote.

The comparative sterility of milk bottles and milk cartons, S. B. THOMAS and E. JENKINS (*Welsh Jour. Agr.*, 16 (1940), pp. 258-260).—An examination of the sanitary properties of glass milk bottles and paper milk containers indicated that even carefully washed and sterilized bottles generally exceeded the paper cartons in bacterial contamination. The importance of improved procedures for sampling dairy utensils is stressed, since it was found that the commonly used rinsing method removed only about one-half of the total organisms present in the first rinse, and significant numbers were obtained even at the fourth rinse.

A small electric holder type pasteurizer, C. W. ENGLAND, A. P. WIEDEMER, and G. J. BURKHARDT. (Md. Expt. Sta.). (*Jour. Milk Technol.*, 4 (1941), No. 4, pp. 187-194, figs. 5).—Supplementing an earlier report which described this apparatus (E. S. R., 85, p. 545), data are presented to show that on the basis of physical, chemical, and bacteriological tests on milk this simple method of electric pasteurization compares favorably with the conventional vat-holder method using hot water as a heating medium. The consumption of electric power for pasteurizing a 12-gal. batch of milk ranged from about 2 kw.-hr. when

the initial temperature of the milk was 90° F. to 3.6 kw.-hr. with a starting temperature of 38°.

Some bacteria grow during pasteurization of milk, R. S. BREED (*Farm Res.* [*New York State Sta.*], 7 (1941), No. 4, pp. 9, 15).—A discussion of the importance of thermophilic and thermoduric bacteria in milk, with practical suggestions for preventing their introduction into milk supplies. Reference is made to an earlier publication (*E. S. R.*, 67, p. 306).

No objection to pasteurized milk on nutritional basis, C. A. ELVEHJEM. (*Univ. Wis.*). (*Milk Plant Mo.*, 30 (1941), No. 7, pp. 26–29, 40).—A review, from which the author concludes that the only two nutritive factors which may be reduced by pasteurization are vitamins B₁ and C. By observing proper precautions in pasteurization, reduction of these factors may be held to approximately 20 percent.

The resazurin test, S. B. THOMAS and M. DAVIES (*Welsh Jour. Agr.*, 16 (1940), pp. 231–247).—In a study at University College, Aberystwyth, both the resazurin and the methylene blue reduction tests were applied to about 4,000 samples of milk, including both summer and winter supplies. Results were in essential agreement in about 81 percent of the cases. Relatively more samples failed the methylene blue test during summer, while more failed the resazurin test during autumn and winter. The degree of reduction of resazurin in 1 hr. at 37° C. showed reasonably close correlation with the keeping quality of the milk, but that of samples failing to reduce the dye varied considerably. Samples failing both resazurin and methylene blue tests consistently were high in bacterial counts, while those which passed the methylene blue but failed the resazurin test were generally low in bacteria but high in leucocyte count. A rather high percentage of fall and winter milks fell in the latter class. Further studies confirmed that the proportion of samples reducing resazurin increased with increasing leucocyte counts, while this factor had a less marked and more variable effect on methylene blue. Holding milk samples in cold storage prior to applying the resazurin test did not significantly influence reduction time. Exposure of the tubes to sunshine, even for 1 min., was found to have a very significant effect on the final grading of milk by the resazurin test. The inversion of the test tubes at intervals during the reduction period tended to increase the resazurin reduction time slightly and is not recommended. Much more reliable results were obtained by conducting this test at a controlled temperature of 37° than at room temperatures. The reading of tests under artificial light or subdued daylight is recommended. Comparative results indicated a definite advantage for the resazurin test over methylene blue reduction for the detection of the activity of a thermophilic flora under 500,000 per cubic centimeter.

Cause and prevention of oxidized flavor in milk, C. D. DAHLE. (Pa. Expt. Sta.). (*Milk Plant Mo.*, 30 (1941), No. 9, pp. 29–34).—A review, with 19 references to the literature.

Preventing oxidized flavor in milk (use of cereal extract), D. V. JOSEPHSON and C. D. DAHLE. (Pa. Expt. Sta.). (*Milk Dealer*, 30 (1941), No. 11, pp. 29, 60, 62).—Experiments were conducted in which 0.02 percent of a concentrated water extract of white corn flour (70 percent total solids) was added to whole milk contaminated with various amounts of copper. This cereal concentrate exhibited a definite antioxygenic effect, entirely preventing the development of oxidized flavor for 24 hr. in milks containing up to 2 p. p. m. of copper. Oxidized-flavor development was definitely retarded during normal storage periods. Similar tests with a commercially prepared cereal extract (Avenex) demonstrated the antioxygenic effect of this product when added to copper-contaminated whole milk.

Holding cream for buttermaking, D. H. JACOBSEN and T. A. EVANS (*South Dakota Sta. Bul. 350 (1941), pp. 12, figs. 2*).—Twenty-three separate lots of cream, including nine of first grade without culture, nine of first grade plus culture, and five of second grade without culture, were used in this study. Each lot was divided into three equal portions and treated as follows: (1) Pasteurized and churned fresh, (2) pasteurized and held 48 hr. before churning, and (3) held in a raw state for 48 hr., pasteurized, and churned. All butters were salted at the rate of 2 percent. Data are presented on the bacterial counts, chemical analyses, and scores of butter while fresh and after 3 and 5 months' storage. Scores on the fresh butter from cream handled in the three different ways were similar, with no consistent advantage for any one. After 5 months' storage a slight advantage was noted for butter from cream churned fresh over that from cream held in the raw condition which, in turn, slightly excelled that from cream held after pasteurization. These differences were so slight, however, that it is concluded that factors other than the cream-holding methods influenced the results.

Cereal antioxidant prevents tallowiness in butter, W. J. CORBETT, P. H. TRACY, and C. N. HANSEN. (Univ. Ill. et al.). (*Food Indus., 13 (1941), No. 8, pp. 34-36, 74, fig. 1*).—A cereal concentrate of sirupy consistency containing about 70 percent total solids was tested as an antioxidant in butters manufactured both from sweet cream and No. 2 grade sour cream. Sweet cream butter to which the concentrate was added generally had better keeping quality than the control lots, the improvement in score ranging from $\frac{1}{2}$ to 2 points. This beneficial effect was evident both in the control lots free from copper and in those containing small amounts. However, the addition of as much as 0.4 percent of the concentrate on a fat basis did not entirely inhibit oxidized flavor development during storage. The addition of the concentrate to the sour cream not only improved the keeping quality of the butter but also improved the flavor score of the fresh butter. Salt treated with the concentrate to give a finished dry salt containing about 0.8 percent of the cereal solids was slightly beneficial in improving the keeping quality of butter during a short storage period. This effect was not evident after 10 weeks' storage. Parchment butter wrappers sized with oat flour proved superior to untreated wrappers in preserving surface quality in butter, although this effect tended to diminish with increasing length of storage.

A study of factors influencing the quality of cultured skim milk or buttermilk, F. V. KOSIKOWSKY and H. J. BRUECKNER. (Cornell Univ.). (*Milk Dealer, 30 (1941), No. 11, pp. 36-38, 40, 42, 44, 46, 48, 50, 71-74, figs. 12*).—Viscosity and degree of separation of whey were employed as criteria of quality in the trials reported. Uniform methods of handling cultures were employed throughout. All samples were incubated at 72° F. for 12 hr. Viscosity and wheying-off determinations were then made after holding the broken curd for 24 hr. at temperatures of 50° and 56°. The viscosity of cultured skim milk was found to be directly related to the acidity at the time of breaking the curd. Also, as acidity increased, the degree of wheying off decreased. Underripening at the time the curd was broken was directly related to whey separation until an acidity of 0.725 to 0.750 percent was reached. At acidities below 0.70 percent the viscosity of cultured skim milk showed little relation to the solids-not-fat content, but at higher acidities a direct relationship existed. Whey separation was not significantly affected by the percentage of solids-not-fat. Tests with pasteurization temperatures ranging from 150° to 210° gave evidence of maximum viscosity and minimum whey separation when a temperature of 185° for 30 min. was employed, while 150° for 30 min. gave minimum viscosity and maximum

whewing off. Other temperatures above or below 185° gave intermediate results. The addition of pancreatic enzyme to the whole milk before separation or to the skim milk in a concentration of 1:15,000 reduced the viscosity of the cultured skim milk without increasing whey separation. Flavor score was not affected by the addition of the enzyme. A storage temperature of 38° was more effective than higher temperatures in preventing whey separation up to 3 days' storage. Beyond this time the effectiveness of the lower temperature was not apparent.

Factors affecting quality of Cheddar cheese, S. L. TUCKEY. (Univ. Ill.). (*Natl. Butter and Cheese Jour.*, 32 (1941), No. 9, pp. 12-13, 60-61).—This report deals primarily with the relation of salt content of Cheddar cheese to flavor score. Experiments in which parts of the cheese were removed from the vat after salting periods of 20, 40, and 60 min. gave cheeses containing on the average 1.34, 1.57, and 1.69 percent salt, respectively. When judged after 5-9 mo. the cheese salted for 60 min. received a higher flavor score than that salted only 20 min. Bitter flavor was usually encountered in the low-salt cheese and occasionally in that salted for 40 min., but never in the cheeses containing around 1.7 percent salt. High salt tended to weaken the body of the cheese. It is suggested that cheese to be aged 6-12 mo. should probably contain more salt than that sold on the fresh market or ripened only to a mild flavor. It is noted also that preliminary tests on methods for speeding up hydrolysis of the butterfat in cheese have not been successful in contributing to the desirable flavors of Cheddar cheese.

Soft cheese, I-III, G. D. LE ROUX (*Union So. Africa Dept. Agr. and Foresty Bul.* 229 [1941], pp. 23, figs. 10; also in *Farming in So. Africa*, 16 (1941), Nos 178, pp. 8-10, 30, figs. 2; 179, pp. 57-59, figs. 4; 180, pp. 104-107, figs. 4)—The topics of soft cheese as a food, soft cheese varieties intended for immediate use, and semisoft and cream cheese, are discussed in considerable detail.

The manufacture of Gouda cheese, H. B. DAVEL, D. J. RETIEF, and G. VAANDRAGER (*Farming in So. Africa*, 16 (1941), No. 180, pp. 91-96, figs. 6).—As a result of extensive experimentation, a modified method for the manufacture of Gouda cheese is presented. The principal steps in this process include the pasteurization of clean fresh milk below 0.2 percent acidity, the use of about 0.75 percent of fresh active starter, setting the milk at 88° F., and cutting the curd finely when it is on the firm side. After cutting, the curd must be allowed to settle to the bottom of the vat, about 20 percent of the whey is withdrawn to be replaced by an equivalent amount of water at 120° to 140°, and the curd is then cooked at 100° for from 15 to 30 min. The curd is collected at the end of the vat and pressed moderately for about 15 min., after which it is cut to fit the molds, pressed, and salted in brine solution. The cheese can be marketed after from 3 to 5 weeks' ripening.

Effect of humidity on moisture content and forms of lactose in dried whey, P. F. SHARP and H. DOOB, JR. (Cornell Univ.). (*Jour. Dairy Sci.*, 24 (1941), No. 8, pp. 679-690, figs. 3).—Whey-drying processes are described, some of which induce lactose crystallization as the alpha-lactose hydrate and others in which the beta lactose crystallizes as a solid phase. Experiments in which different lots of dried whey were subjected to controlled levels of relative humidity indicated that those in which crystalline beta lactose was present as the solid phase contained less water when in equilibrium with an atmosphere of constant relative humidity below 65 percent than those in which the alpha hydrate formed the solid phase. Samples reached equilibrium more rapidly at higher temperatures. At relative humidities above 65 percent crystalline beta lactose was converted to the crystalline alpha hydrate. Excessive amounts of moisture were not absorbed by the stabilized dried wheys until relative humidity

exceeded 40-50 percent. When dried wheys containing appreciable amounts of lactose in the glass state were exposed to relative humidities of 30-50 percent they first absorbed and then rejected moisture, accompanied by crystallization of the solid form of lactose present. As the percentage of lactose in the dry matter decreased, the equilibrium moisture content of the dried whey increased.

Chocolate coating, J. H. ERB. (Ohio State Univ.). (*Ice Cream Trade Jour.*, 37 (1941), No. 5, pp. 18-19, 72-78, figs. 2).—In addition to a general discussion of the problem, the results of experiments to determine the effect of lecithin in chocolate coatings are described. It appeared that the presence of lecithin in a coating containing no added moisture exerted a definite effect on the viscosity of the coating when it contained less than 50 percent fat. When more than 50 percent fat was present, the lecithin produced little additional fluidity unless moisture was incorporated during dipping. The addition of 0.2 percent lecithin effectively counteracted the presence of additional moisture up to 1.5 percent, but increasing the amount of lecithin did not improve its effectiveness. A bob test for determining the covering qualities of chocolate coatings is described.

The need of sanitary control in the manufacture of frozen dairy products, F. W. FABIAN. (Mich. State Col.). (*Jour. Milk Technol.*, 4 (1941), No. 4, pp. 206-209).—A general discussion which emphasizes that good sanitation in the frozen dairy products industry is good economics.

VETERINARY MEDICINE

Endocrinology: The glands and their functions, R. G. HOSKINS (*New York: W. W. Norton & Co.*, [1941], pp. 388, pls. [12], figs. [6]; rev. in *Science*, 94 (1941), No. 2433, pp. 164-165).—This work is presented in 15 chapters, most of which are accompanied by references to the literature. The review is by C. N. H. Long.

[Contributions on animal pathology and parasitology] (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 774, pp. 196-220).—Among the abstracts here given of papers presented at the annual meeting of the American Veterinary Medical Association in August 1941 are the following: Treatment of Bovine Mastitis, by O. W. Schalm (p. 196); Some Observations on the Control of Bovine Mastitis, by W. D. Pounson, B. A. Beach, and E. G. Hastings (pp. 196-197); Feeding as a Contributory Factor to the Development of Chronic Mastitis, by E. N. Moore, A. H. Van Lamingham, C. E. Weakley, Jr., and H. O. Henderson (pp. 197-198); Studies on the Etiology and Pathology of Calf Pneumonia, by W. T. S. Thorp, J. F. Shigley, and M. A. Farrell (p. 198); Bovine Sterility From a Practitioner's Viewpoint, by J. C. Carey (p. 199); Sterility Due to Ovarian Dysfunction, by F. E. Walsh (p. 199); Keratitis in Cattle, by V. T. Rose (pp. 199-200); Physiologic and Metabolic Aspects of Acetonemia in Cattle, by M. H. Roepke (p. 200); Some Vitamin Deficiencies of Cattle, by C. C. Hastings (p. 200); Sporadic Bovine Encephalomyelitis—Filtration of the Causal Agent, by T. W. Stearns and S. H. McNutt (p. 202); Internal Worm Parasites of Cattle in Northern Indiana, by C. H. Smith (pp. 202-203); Vitamin A Deficiencies in Ruminants, by H. Schmidt (p. 203); The Stability of Reduced Virulence Exhibited by *Brucella abortus* Strain 19, by C. K. Mingle, C. A. Manthei, and A. M. Jasmin (pp. 203-204); Acetonemia and Albuminuria in Dairy Cows, by J. N. Campbell (p. 204); The Relation of Leucemia and Bovine Lymphocytoma, by W. W. Thompson and L. M. Roderick (p. 204); The Relationship Between the Blood and Whey Titers and the Occurrence of *Brucella abortus* in the Udder, by H. J. Metzger and F. R. Stokes (p. 206); Some Observations on the Pathology of Pneumonia of the Food-Producing Animals, by R. F. Langham, F. Thorp, Jr.,

and R. T. Ingle (p. 207); Diseases of the Newborn in the Equine Species, by R. A. McIntosh (p. 209); A Practitioner's Experience With Infectious Hemorrhagic Dysentery of Swine, by T. L. Steenerson (pp. 210-211); Tests on the In Vitro Neutralization of Hog-Cholera Virus With Hog-Cholera Antiserum, by H. C. H. Kernkamp and M. H. Roepke (p. 211); Studies on Baby-Pig Mortality—II, Further Observations on Acute Hypoglycemia in Newly Born Pigs, by J. Sampson, H. R. Hester, and R. Graham (pp. 211-212); Significance of Distemper Inclusion Bodies, by W. Wisnicky and L. Wipf (p. 213); Canine Encephalitis and Post-Encephalitis, by C. H. Beckman (p. 213); Studies on Production of Specific Antibodies Against the Agent of the Fowl-Leucosis Complex, by C. D. Lee (p. 214); The Use of Vinylite Resin Corrosion Preparations in the Study of the Organs of the Domestic Fowl Affected With the Avian Leucosis Complex, by G. E. Cottral (p. 214); The Present Status of Avian Encephalomyelitis, by E. Jungherr and E. L. Minard (p. 215); A Review of 3,000 Wild Bird Autopsies on Western Lake Areas, by E. R. Quortrup and J. E. Shillinger (pp. 215-216); *Salmonella* Infections of Breeding Turkeys, by B. S. Pomeroy and R. Fenstermacher (pp. 216-217); Paratyphoid Infection in Quail, by C. H. Cunningham (p. 217); Further Studies on the Propagation of Fowl Leucosis in Chick Embryos by Intravenous Inoculation, by W. J. Hall and M. Pollard (pp. 217-218); Preliminary Report on Interspecies Transmission of Avian Leucosis in Embryos, by M. Pollard and W. J. Hall (p. 218); Serial Passage of Strain 3, Lymphomatosis-Osteopetrosis in Chickens, by C. A. Brandy, N. M. Nelson, and G. E. Cottral (p. 219); Further Observations on a Blood Protozoon of Turkeys Transmitted by *Simulium nigroparvum* (Twinn), by E. P. Johnson (pp. 219-220) (E. S. R., 82, p. 827); and Transmission of Avian Encephalomyelitis, by H. Van Roekel, K. L. Bullis, and M. K. Clarke (p. 220).

[Work in animal pathology and parasitology by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1940*, pp. 10-14, 36-37, 158-160, 234-238).—The work of the year (E. S. R., 84, p. 813) reported upon includes infectious bovine abortion, by H. Schmidt, R. D. Turk, O. C. Copeland, and C. N. Shepardson; trichomonad abortion of cattle, by Schmidt, Turk, and Shepardson; loco weed poisoning, poisonous plants in the Davis Mountains, and stiff sheep, all by F. P. Mathews; pathological conditions accompanying vitamin deficiencies, by Schmidt; mastitis investigations, by Schmidt, Turk, and A. L. Darnell; disease resistance in animals, by B. L. Warwick, Turk, Schmidt, and R. O. Berry; at the Angleton Substation, anaplasmosis in cattle, by P. L. Piercy; the relationship of the Gulf coast tick to screwworm infestation in livestock and methods for its control, by Piercy and C. A. Woodhouse; toxemia among cattle of the Gulf coast area of Texas, by J. J. Reid and Schmidt; investigation of gastrointestinal parasites in cattle, by Woodhouse, Reid, and Schmidt; and at the Sonora Substation, contagious ecthyma (soremouth) of sheep and goats, stomach worms (*Haemonchus contortus*) in sheep and goats, hard yellow livers of sheep and cattle, feeding trials of suspected plants, infectious enterotoxemia of lambs, infectious keratitis of sheep and goats, and sporadic bovine encephalomyelitis, all by I. B. Boughton and W. T. Hardy.

[Contributions in animal pathology] (In *Cornell University Abstracts of Theses, 1940*. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 279-281, 363-375).—Among the theses in this field, abstracts of which are given, are: The Relationship Between Body Temperature and Genetic Resistance to *Salmonella pullorum* in the Fowl, by J. C. Scholes (pp. 279-281); A Preliminary Study of the Dehydrogenases of *Streptococcus mastitidis*, by A. J. Wood (pp. 363-364); Canine Encephalomyelitis, by D. R. Cordy (pp. 365-367); and Brucellosis in Horses and Goats in New York State, by W. S. Stone (pp. 372-375).

The relation of diseases in lower animals to human welfare (*Philadelphia: Univ. Pa. Press, 1941, pp. [3]+39*).—The Relationship of Animal Diseases to Human Welfare (pp. 1-12) is dealt with by J. R. Mohler, Veterinary Research and Public Health (pp. 13-26) by R. A. Kelser, and Progress in Veterinary Medicine (pp. 27-39) by C. Way.

Relation of equine encephalomyelitis to the epidemic of human encephalitis in Saskatchewan in 1938, J. S. FULTON (*Canad. Pub. Health Jour., 32 (1941), No. 1, pp. 6-12*).

Transmission of animal diseases to man through milk, M. P. RAVENEL (Univ. Mo.). (*Canad. Pub. Health Jour., 32 (1941), No. 4, pp. 174-182*).

The present status of milk-borne disease hazards, C. E. DOLMAN (*Canad. Pub. Health Jour., 32 (1941), No. 4, pp. 183-193*).

Immunity against animal parasites, J. T. CULBERTSON (*New York: Columbia Univ. Press, 1941, pp. VIII+[2]+274, figs. [71]*).—Part 1 of this work (pp. 9-88) relates to natural resistance and acquired immunity, part 2 (pp. 89-219) to immunity in specific diseases, and part 3 (pp. 221-247) to applied immunology.

Studies on the life history of the anoplocephaline cestodes of hares and rabbits, H. W. STUNKARD (*Jour. Parasitol., 27 (1941), No. 4, pp. 299-325, pls. 5*).—This contribution is presented with a list of 23 references to the literature.

The pathology of *Eimeria leporis* (coccidia) in the cottontail rabbit, E. F. WALLER and B. B. MORGAN. (Iowa State Col. and Univ. Wis.). (*Amer. Jour. Hyg., 34 (1941), No. 2, Sect. C, pp. 83-85, figs. 3*).—An intestinal coccidium of the hare, found and described by Nieschulz in 1923, has been discovered by the authors to occur in North America in the Iowa cottontail rabbit (*Sylvilagus floridanus mearnsi*) in 1940 (E. S. R., 83, p. 791) and later on in rabbits in Wisconsin. It has been found to produce characteristic gross lesions in the vermiform appendix and about the ileocecal valve of this cottontail. The tissue reaction of the host was not great. The parasites were present in great numbers, and multiple parasitism (2 to 5 coccidia) were frequently observed in single epithelial cells.

A note on *Encephalitozoon cuniculi* infection in a rabbit, H. N. RAY and K. RAGHAVACHARI (*Indian Jour. Vet. Sci. and Anim. Husb., 11 (1941), No. 1, pp. 38-41, pl. 1*).—*E. cuniculi*, known to produce spontaneous encephalitis and nephritis in a rabbit, is recorded for the first time in India from the kidney of a rabbit which had succumbed to experimental trypanosomiasis. Its morphology is described in detail. The different stages of development encountered in this parasite strongly suggest its microsporidian affinity, although the polar filament was not observed. Transmission experiments carried out on rabbits were ineffectual.

A study of some Australian strains of *Erysipelothrix*, N. ATKINSON (*Austral. Jour. Expt. Biol. and Med. Sci., 19 (1941), No. 1, pp. 45-50*).

The biology of *Haemaphysalis humerosa* Warburton and Nuttall (Acarina: Ixodidae) in Queensland, D. J. W. SMITH (*Austral. Jour. Expt. Biol. and Med. Sci., 19 (1941), No. 1, pp. 73-75, fig. 1*).—An account is given of the occurrence and life cycle of the tick *H. humerosa*, a known vector of Q fever.

Microorganisms of group E of the genus *Salmonella*, with special reference to a new *Salmonella* type, D. W. BRUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Amer. Jour. Hyg., 34 (1941), No. 2, Sect. B, pp. 82-86*).—Report is made of a study of 64 cultures of group E of the genus *Salmonella*. The types recognized included *S. senftenberg*, *S. london*, *S. give*, *S. anatum*, *S. lexington*, *S. newington*, and *S. new-brunswick*. The organisms were isolated from turkeys, chickens, ducks, hogs, man, and water. A new *Salmonella* type, *S. melcagridis*, the antigenic formula of which is III X XXVI : eh : lw, is described.

Observations on the modified Gordon-Whitlock method for the counting of helminth ova in horse faeces, W. P. BLOUNT (*Jour. Roy. Army Vet. Corps*, 12 (1941), No. 2, pp. 69-78, figs. 7).—A modification of the Gordon-Whitlock egg-counting chamber which has a capacity of four times that of the original is described. For accurate estimation of eggs of intestinal parasites in horse feces, it is recommended that the fluid to be examined should be prepared from 20 gm. of mixed feces diluted 1 : 15 with half saturated salt solution. Approximately 1 cc. of this liquid should be examined microscopically. For the preservation of horse feces for egg-count purposes, both phenothiazine and Mefarol have been found superior to "compression" of the excreta.

The antigenicity of chick embryo, J. VAN DER SCHEER, R. W. G. WYCKOFF, and E. BOHNEI (*Jour. Immunol.*, 41 (1941), No. 4, pp. 391-395).

The behavior of pox viruses in the respiratory tract, I-IV, J. B. NELSON (*Jour. Expt. Med.*, 68 (1938), No. 3, pp. 401-412, pl. 1; 70 (1939), No. 1, pp. 107-116, pls. 2; 71 (1940), No. 5, pp. 653-660, pl. 1; 74 (1941), No. 3, pp. 203-212, pl. 1).—These parts deal with the response of mice to the nasal instillation of (I) vaccinia virus (pp. 401-412); and (II) variola virus (pp. 107-116); III, The Survival of Variola and Vaccinia Viruses in the Lungs of Mice Previously Infected With Variola (pp. 653-660); and IV, The Nasal Instillation of Fowl Pox Virus in Chickens and in Mice (pp. 203-212).

Strain-specificity of complement-fixation with sera of mice immune to the virus of influenza A and swine influenza, M. D. EATON (*Jour. Immunol.*, 41 (1941), No. 4, pp. 383-390, fig. 1).

Plants poisonous to live stock in New York. (Cornell Univ.). (*Vet. Med.*, 36 (1941), No. 9, pp. 474-477, figs. 2).

The toxicity of wild passion vine (*Passiflora alba* (Link and Otto)), W. L. HINDMARSH (*Austral. Vet. Jour.*, 17 (1941), No. 4, pp. 142-146).—The experiments reported have shown *P. alba* to be poisonous to sheep, and confirm earlier work by Dodd (E. S. R., 25, p. 589) revealing it to be poisonous to cattle when eaten in sufficient amount.

The use of chloroform to accelerate cyanogenesis in the analysis of cyanogenic plants, J. F. COUCH and R. R. BRIESE. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 7, pp. 285-288).

The excretion of selenium by rats on a seleniferous wheat ration, H. D. ANDERSON and A. L. MOXON. (S. Dak. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 2, pp. 103-108, figs. 2).—In experimental work, the greater portion of the selenium absorbed by rats from naturally occurring seleniferous wheat was excreted when the animals were transferred to a nonseleniferous stock ration. Some of the selenium was eliminated very slowly and seemed to be bound by the body tissues, but the greater portion appeared to be eliminated within 2 weeks. Young rats appeared to store more selenium in the body tissues other than liver than old rats. Storage in the livers appeared to be similar. Feeding of the toxic ration for only 4 weeks had a depressing effect upon the body weight of both young and adult rats.

Chloro-hexyl-meta-cresol, related cresols, and other insecticides which have low toxicity for mammals, YIN-CH'ANG CHIN and H. H. ANDERSON (*Peking Nat. Hist. Bul.*, 16 (1941), No. 1, pp. 45-53).—Hydroalcoholic solutions and aqueous soap emulsions of chlorohexylmetacresol have been found to possess insecticidal properties in concentrations of 1 and 2.5 percent. Death was caused in rats at 6 cc. per kilo by stomach administration and in mice at 4 cc. per kilo by subcutaneous injection. "Since chlorination of the hexylcresols has been found to decrease their toxicity for mammals, we have an approach to a chemotherapeutic control of myiasis in man and in animals and of the insect vectors of disease."

Phenothiazine as an anthelmintic for horses, cattle, and pigs, F. H. S. ROBERTS (*Austral. Vet. Jour.*, 17 (1941), No. 4, pp. 130-137).—Tests of the proprietary compound Phenovix, which contains 90 percent phenothiazine, are reported. The tests with horses have revealed it to be highly effective against strongyles and very satisfactory against ascarids. Since there is evidence indicating that under certain conditions it may be toxic to horses, sometimes seriously so, it is suggested that these toxic effects may to some degree be safeguarded against by feeding large quantities of bran before, during, and for some days after treatment. The doses of phenothiazine suggested for horses are: Heavy drafts 2 oz.; light to medium drafts 1.5; thoroughbreds, van types, 1; and smaller horses from 0.5 to 1 oz. The experiments with cattle reported indicate that phenothiazine must be used with the greatest care in the case of bovines. The dose for calves up to 6 mo. old should not exceed 30 gm., a dose which is highly effective for such animals. Tests with pigs infested by *Oesophagostomum* spp. have led the author to suggest the following dose rates: Up to 20 lb., 5 gm.; from 20 to 40 lb., 5-10 gm.; from 40 to 80 lb., 10-20 gm.; from 80 to 160 lb., 20-40 gm.; and over 160 lb., 40 gm.

The influence of dietary factors upon the therapeutic activity of sulfanilamide in mice, S. M. ROSENTHAL (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 38, pp. 1880-1889, figs. 3).—Wide variations in the therapeutic response to sulfanilamide were produced in mice by alterations in the diet. A study of dietary constituents indicated that the protein fraction is important in the inhibition of the action of sulfanilamide. Mice on a diet deficient in proteins have shown higher concentrations of sulfanilamide in the blood.

Effects of sulfanilamide and sulfamethylthiazol on experimental *Brucella* (var. *melitensis*) infection in mice, P. MORALES-OTERO and A. POMALES-LEBRÓN. (*Univ. P. R.*). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 512-515).—In the experiments reported, sulfamethylthiazol proved to be more effective than sulfanilamide in the treatment of experimental *Brucella* infection in mice. The results suggest that the proliferation of the organisms is only partially inhibited by treatment, with a tendency towards the establishment of chronic infection. These drugs may be of use in the study of chronic infection in the experimental animals.

Pyrethrum in medicine, W. K. ANGEVINE (*Soap and Sanit. Chem.*, 17 (1941), No. 3, pp. 101, 103).—The value of pyrethrum compounds in the treatment of scabies, as shown by 1,213 cases treated, is emphasized in this contribution. It is pointed out that pyrethrum is a central nervous toxin to cold-blooded animals, and that its active principles are harmless to warm-blooded animals, including man.

Germicidal activity of soaps.—[I], II, A study of the comparative germicidal value of rosin soaps and soaps of individual fatty acids, L. S. STUART and W. D. POHLE. (*U. S. D. A.*). (*Soap and Sanit. Chem.*, 17 (1941), Nos. 2, pp. 34-37, 73-74; 3, pp. 34-37, 73-74, figs. 8).—Presented with a list of 19 references to the literature.

Are soaps germicidal? E. G. KLARMANN and V. A. SHTERNOV (*Soap and Sanit. Chem.*, 17 (1941), No. 1, pp. 23-26, 70, fig. 1).—Tables are given for potassium soaps of saturated aliphatic acids with the minimum germicidal concentration (1) of original solutions of potassium salts for forms representing five genera of micro-organisms and (2) of seven brands of toilet soaps for two genera of micro-organisms, in 5, 10, and 15 min. It was found that the antibacterial properties displayed by the commercial soap products tested were not such as to entitle this kind of soap to any one of the designations 'disinfectant,' 'antiseptic,' or 'germicidal.'

Brucellosis (undulant fever): Clinical and subclinical, H. J. HARRIS (*New York and London: Paul B. Hoeber, [1941], pp. XIX+[2]+286, [pl. 1], figs. 22*).—Presented in 10 chapters and a bibliography of 15 pages.

The conquest of brucellosis in animals and its relation to human health, J. R. MOHLER. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 99 (1941), No. 775, pp. 263-271*).

Treatment of brucellosis with Brucella antigens, M. R. CASTANEDA and C. C. CARDENAS (*Amer. Jour. Trop. Med., 21 (1941), No. 2, pp. 185-190*).—The response of 35 cases of brucellosis to treatment with *Brucella* antigens prepared from the bacterial bodies by grinding *Brucella* of the three varieties is said to have been rapid, with a sustained improvement and no severe reactions. No mortality occurred even in those cases with a rather unfavorable prognosis.

Onderzoekingen over mond- en klauwzeer: Type-differentiatie van het hier te lande voorkomende virus [Differentiation of type of foot-and-mouth disease virus in the Dutch East Indies], E. DE BOER (*Nederland. Indische Bl. Diergeneesk., 53 (1941), No. 2-3, pp. 127-141, fig. 1; Eng. abs., p. 141*).—Of six strains of foot-and-mouth disease virus obtained from various parts of Java, all proved to belong to type A.

A report of immunisation experiments against Newcastle disease, using crystal violet vaccine, S. G. IYER and N. DOBSON (*Vet. Rec., 53 (1941), No. 27, pp. 381-383*).—The immunological work with fowl-passaged virus of Newcastle disease here reported gave negative results.

The avian tuberculin test and its specificity, H. N. SPEARS and N. DOBSON (*Vet. Rec., 53 (1941), No. 26, pp. 365-370, fig. 1*).—The findings here reported in tables show the avian tuberculin test to be a reliable one on the positive side and that the small percentage of apparently nonspecific reactions is insignificant.

Further evidence of the inability of Brucella abortus strain 45 (20) to infect non-pregnant cattle, A. D. McEWEN (*Vet. Rec., 53 (1941), No. 25, pp. 351-353*).

Cobalt deficiency in some Michigan cattle, B. J. KILLHAM. (Mich. State Col.). (*Jour. Amer. Vet. Med. Assoc., 99 (1941), No. 775, pp. 279-282*).—Clinical evidence obtained indicates that the Grand Traverse or Lake Shore disease of cattle in Michigan is essentially a condition due to cobalt deficiency. Biochemic investigations have demonstrated a low concentration of hemoglobin in the blood and no evidence of ketosis or phosphorus deficiency. After the administration of cobalt hemoglobin regeneration occurred slowly, but the treated animals exhibited a spectacular return of appetite and a progressive improvement in condition and production. Preliminary chemical investigations of corn and hay grown on farms where there were affected cattle have shown the cobalt content to be much lower than for hay grown on farms in unaffected areas.

"Falling disease" of cattle in the south-west of Western Australia—II, Studies of copper deficiency in cattle, H. W. BENNETTS, A. B. BECK, R. HARLEY, and S. T. EVANS (*Austral. Vet. Jour., 17 (1941), No. 3, pp. 85-93*).—In continuation of this study (E. S. R., 82, p. 388), the authors report having found a very low copper status of pastures and of animals to be constantly associated with the occurrence of falling disease. The etiology of the disease remains obscure, but the investigation of the role played by copper had led to the accumulation of experimental and other data relative to what appears to be an uncomplicated copper deficiency disease of cattle in the southwest of this State. Clinically the manifestations of copper deficiency are malnutrition, anemia, a depraved appetite, and in cows frequent temporary sterility. Young animals show marked evidences of malnutrition and abnormal development; intermittent diarrhea and anemia are frequently present. The pathology of

this disease has been studied only incompletely. The most marked features are anemia and hemosiderosis, the anemia in cows being of the macrocytic, hypochromic type. In an experimental dairy herd optimal response was obtained by the administration of pure copper supplements; the addition of other minerals had no appreciable beneficial effect. Under field conditions the widespread use of mineral supplements containing copper has resulted in a marked improvement in health and production of the entire herds, and apparently in the prevention of any occurrence of falling disease in cows receiving such supplements.

The distribution of bracken in its possible relation to bovine haematuria in British Columbia, H. GROH (*Sci. Agr.*, 21 (1941), No. 11, pp. 703-710, fig. 1).—In its distribution in British Columbia, bracken or brake fern (*Pteridium aquilinum lanuginosum*) appears to be restricted to regions with an annual precipitation of 20 in. or more, and within such a region it is selective of the better drained sites. The rather striking appearance of an association between red-water disease and bracken in the lower Fraser Valley, elsewhere in British Columbia, and in at least some other countries must be viewed in the light of the fact that cattle in other bracken territory, i. e., in all of eastern North America, have never been known to be affected. A list is given of 17 references to the literature.

Johne's disease infection of laboratory animals, L. SAHAI (*Vet. Jour.*, 97 (1941), No. 3, pp. 101-104).—A continuation of this contribution (E. S. R., 84, p. 525).

The standardization of johnin.—II, Purification of johnin and its comparison with an unpurified product, R. E. GLOVER (*Vet. Jour.*, 97 (1941), No. 6, pp. 179-193).—A report of further work (E. S. R., 84, p. 817).

Chronic bovine mastitis: Factors possibly related to its pathogenesis, J. FRANCIS (*Vet. Rec.*, 53 (1941), No. 28, pp. 395-399).—This review is accompanied by a list of 54 references to the literature cited.

Rhododendron "poisoning" in cattle, J. W. H. MASHETER (*Vet. Jour.*, 97 (1941), No. 7, pp. 223-225).

Observations on rinderpest immunisation with goat virus, R. L. CORNELL and RATANA OONYWONGSE (*Indian Jour. Vet. Sci. and Anim. Husb.*, 11 (1941), No. 1, pp. 1-15).—A goat virus strain of rinderpest of an indeterminate number of passages through goats (many hundreds) was tested on cattle from various parts of Thailand and found to be safe for these animals. In a field trial involving 2,870 head, only two deaths were recorded. The number of cases described as reacting markedly and possibly more than desirable was only 14.

The efficacy of udder infusion with entozon as a treatment for infection with group B streptococci (Str. agalactiae), D. F. STEWART (*Vet. Rec.*, 52 (1940), No. 49, pp. 845-847).—The use of entozon in the treatment of mastitis due to *Streptococcus agalactiae* resulted in the eradication of the infection from 70 percent of 40 affected cows in two herds after three treatments.

The effect of alfalfa lipids upon the progress of sweet clover poisoning in cattle, W. A. KING, H. A. CAMPBELL, I. W. RUPEL, P. H. PHILLIPS, and G. BOHSTEDT. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 1, pp. 1-8, fig. 1).—Work reported by Phillips and his associates (E. S. R., 81, p. 403) having indicated that cattle need added vitamin K on certain diets, an attempt was made to ascertain whether or not this vitamin was associated with toxic sweet-clover poisoning. In the experiments conducted 10 percent of the ration of growing cattle was made up of toxic sweetclover and fed without harm for a period of 3.5 mo. Animals with a prolonged clotting time developed an increased number of blood platelets. There was no change in the fibrin, hemoglobin, or serum calcium in these cases. Crude petroleum ether extracts of

alfalfa hay fed at a level equivalent to 60 percent of the toxic sweetclover in the ration brought about a favorable remedial response in sweetclover poisoned young cattle. Evidence adduced from the separate effects upon whole blood clotting time and prothrombin clotting time, the administration of bile salts alone and with alfalfa lipids, and the difference in rate of return to normal between the prothrombin and blood clotting times when the toxic hay was withdrawn from the ration indicates that one or more factors other than prothrombin were involved in the restoration of the normal blood clotting mechanism of the sweetclover poisoned bovine.

Studies on the hemorrhagic sweet clover disease.—II, The bioassay of hemorrhagic concentrates by following the prothrombin level in the plasma of rabbit blood, H. A. CAMPBELL, W. K. SMITH, W. L. ROBERTS, and K. P. LINK. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Biol. Chem.*, 138 (1941), No. 1, pp. 1-20, figs. 4).—In reporting further upon these studies (E. S. R., 84, p. 814), description is given of a method for determining the prothrombin level in rabbit blood, based upon the procedure of A. J. Quick et al.⁷ and developed to appraise accurately the relative prothrombin-inactivating powers of spoiled sweetclover hay and concentrates prepared therefrom. The procedure for the standardization of the assay rabbits and the method of evaluating prothrombin-inhibiting concentrates are given in detail. It is pointed out that, since rabbits vary greatly in their susceptibility to the hemorrhagic agent in spoiled sweetclover hay, only susceptible rabbits should be employed.

The reagents and components (except the thromboplastin) used in the prothrombin determination are similar to those of Quick, but the order of combining them has been changed. This diminishes the possibility of errors through the contamination of the reagents. Details are given for the preparation of thromboplastin, whose activity is readily maintained several months by storage at 0°. Only plasma diluted to the concentration range 25 to 5 percent is used, as this permits the detection of smaller changes in the prothrombin activity and simultaneously diminishes the adverse effects of antithrombins. Plasma from a normal rabbit can be stored at 0° for several days without undergoing an appreciable change in the prothrombin activity. This permits a simultaneous comparison of normal plasma drawn from the same rabbit after prothrombin depletion under identical experimental conditions and eliminates the necessity of obtaining absolute prothrombin values. The plasma of rabbits whose prothrombin level has been diminished owing to the action of the hemorrhagic agent in spoiled sweetclover hay is less stable than the plasma of normal rabbits. The clotting times are evaluated through the use of a log-log dilution curve constructed for each rabbit under assay. The ratio of the concentration of the plasma before feeding (in the concentration range of 12.5 to 8.34 percent) to the concentration of plasma after feeding, which gives the same clotting time, is taken as a relative index of the amount of prothrombin inactivated. The rabbit does not acquire immunity to the hemorrhagic agent in spoiled sweetclover hay, which makes it possible to use the assay rabbits repeatedly after a brief period for recovery is allowed.

Use of sodium bifluoride and sodium silicofluoride in the disinfection of hides, C. A. MANTHEI and A. EICHORN. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 1, pp. 41-48).—In a study of the efficiency of sodium bifluoride and sodium silicofluoride as hide disinfectants, use was made of the virus of vesicular stomatitis as the infective agent. Two methods of procedure were followed: Salt-cured calfskin in the presence of infected guinea pig pads and salt-cured calfskin artificially impregnated with the virus were placed in

⁷ Amer. Jour. Med. Sci., 190 (1935), No. 4, pp. 501-511.

the various soak solutions for 24- and 48-hr. periods at room temperature. The proportion of salt-cured calfskin to the quantity of soak solution was 1:5 by weight. Both sodium bifluoride and sodium silicofluoride constantly killed the virus in dilutions of 1:10,000 after 24 hours' soaking. By analogy with similar research by the British Foot-and-Mouth Disease Research Committee, it is considered a logical assumption that sodium bifluoride and sodium silicofluoride are also effective in destroying the virus of foot-and-mouth disease.

Field tests with phenothiazine as an anthelmintic in cattle, D. A. PORTER, B. T. SIMMS, and G. E. CAUTHEN. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 59 (1941), No. 775, pp. 272-278).—The results of tests conducted with a view to determining the anthelmintic efficacy of phenothiazine in cattle under field conditions are reported, the details being given in tables. The work involved administration of unconditioned phenothiazine by capsule and mixed with grain ration to a group of moderately parasitized bulls and administration of cunic and unconditioned phenothiazine separately to groups of heavily parasitized yearlings. The effectiveness of the drug was judged by the reduction in the number of worm eggs per gram of feces.

"Unconditioned phenothiazine in doses of 0.12 to 0.49 gm. per pound of body weight (0.27 to 1.1 gm. per kilo) was equally effective in the removal of gastrointestinal nematodes from 2-year-old bulls. The drug was equally effective when given in capsules or in grain mixtures, but the capsule method was more convenient to use. Doses of 40 to 60 gm. given to heavily parasitized yearlings weighing about 175 to 300 lb. (approximately 0.2 gm. per pound of body weight, or 0.44 gm. per kilo) were, except in one animal, very effective against gastrointestinal nematodes. Doses of 3 to 5 oz. of a 1.5 percent copper sulfate and 0.6 percent nicotine sulfate solution were ineffective as an anthelmintic when compared with results obtained with phenothiazine given at a dose rate of about 0.2 gm. per pound of body weight. Marked physical improvement of the phenothiazine-treated animals was evident from the increase in the volume of packed red blood cells following loss of parasites. The data indicated that although the cooperids [*Cooperia* spp.] may not be removed immediately by phenothiazine, general physical improvement of the host following loss of other harmful parasites may result in gradual elimination of these parasites. It is indicated also that serious reinfection of cattle 1 to 2 yr. old may not take place for at least 3 to 4 mo. if moved to clean ground following treatment."

Evidence of mercury poisoning in feeder calves, L. E. BOLEY, C. C. MORRILL, and R. GRAHAM. (Univ. Ill.). (*North Amer. Vet.*, 22 (1941), No. 3, pp. 161-164, figs. 4).—The chemical and histopathological findings in calves which suggested mercury poisoning as the cause of their illness and death emphasize the danger of feeding corn that has been subjected to a mercury fungicide or insecticide.

Control and elimination of internal parasites in calves, B. T. SIMMS. (U. S. D. A.). (*Assoc. South. Agr. Workers Proc.*, 42 (1941), p. 139).—An abstract of a contribution presented at the annual convention of the Association of Southern Agricultural Workers held in February 1941. Phenothiazine in doses of about 0.2 gm. per pound of body weight is said to have given good results in removing stomach and nodular worms from calves.

Infection of calves with *Bacterium enteritidis* var. dublin, J. F. CRAIG, G. O. DAVIES, and K. M. MASSEY (*Vet. Jour.*, 97 (1941), No. 5, pp. 145-155).—Report is made of a calf disease associated with *B. enteritidis dublin* that has been appearing in a dairy herd in Cheshire, England, for a number of years. The organism was isolated from various organs and from the feces and bile

and in one case from a diseased joint. No evidence was found of carriers among the cows. Recommendations are made for the eradication of the disease by sanitary measures.

A study of the factors governing the passage of fluids through the stomach of sheep, I, P. N. NANDA and GURBAX SINGH (*Indian Jour. Vet. Sci. and Anim. Husb.*, 11 (1941), No. 1, pp. 16-27).—The importance of a knowledge of the physiology of the alimentary tract of domestic animals as a guide to the treatment of their diseases by drugs given by mouth led to the study here reported. The experimental data recorded during 1939-40 have shown that "(1) copper sulfate in solution is able to stimulate the reflex closure of the oesophageal groove; (2) the intensity of the stimulation of the reflex with copper sulfate solution is more marked with a stronger solution when administered under identical conditions of preliminary starvation; (3) preliminary starvation is a favorable condition for the stimulation of the reflex, and the ability of copper sulfate solution to stimulate the reflex may be greatly retarded even with a 2 percent solution when the animal is not starved; (4) water, probably, possesses a slight inherent property to pass into the abomasum which increases with the period of preliminary starvation to such an extent that 4 oz. of it when given after withholding food and water for 38-42 hr. will pass as a whole or in bulk into the abomasum; (5) the stimulation of the reflex is not influenced by the mode of administration of fluids; (6) there is some indication that the equilibrium of food and water in the rumen is also a controlling factor in influencing the passage of watery fluids to the various divisions of the stomach of sheep; [and] (7) there is no necessity to fast sheep after routine dosing for gastrointestinal worms, but access to water should be allowed to a limited extent after allowing free grazing for some time."

Wound healing in sheep, W. G. ANDBERG. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 766, pp. 36-37).

Contributing factors causing death in sheep infested with the nodular worm [Oesophagostomum columbianum], D. F. EVELETH and N. W. HILSTON. (Ark. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 9, pp. 449-451, fig. 1).

Comparison of the efficacy of phenothiazine and copper sulphate-nicotine sulphate mixture as anthelmintics for sheep, D. A. SHORB, R. T. HABERMANN, and L. C. HEEMSTRA. (U. S. D. A.). (*Vet. Med.*, 36 (1941), No. 10, pp. 502-506, figs. 2). When standard doses of phenothiazine and of copper sulfate-nicotine sulfate mixture were compared directly for their efficiency in removing helminths from the gastrointestinal tract of sheep, the phenothiazine was much the more effective against all worms present except tapeworms of the genus *Moniezia*. The egg count method as applied in these experiments is considered to offer a means of evaluating the anthelmintic efficacy of drugs and at the same time may serve to correct in part the errors inherent in the critical test.

An experiment with phenothiazine, D. W. KERRUSH (*Vet. Rec.*, 53 (1941), No. 22, pp. 309-310, fig. 1).—The results of a test of phenothiazine on fattening lambs, reported in table form, has shown it to be of value through enabling the lambs to be fattened more easily and more rapidly.

Chemical changes in the blood of swine infected with hog cholera.—II, The serum bases and whole blood hemoglobin and glutathion, D. F. EVELETH, L. H. SCHWARTZ, and T. W. MILLEN. (Iowa State Col.). (*Vet. Med.*, 36 (1941), No. 10, pp. 510-513, figs. 2).—In continuation of the work noted (E. S. R., 81, p. 282), the calcium, magnesium, sodium, and potassium of the serum of swine artificially infected with hog cholera virus were determined. It was found that during the course of the disease there develops a hyperpotassemia, with decreases in the sodium and calcium. A preliminary period of feeding a high calcium phos-

phate ration did not give any protection to the animals when injected with hog cholera virus. In most cases the glutathione content per cell decreased during the course of the disease.

The sectional incidence of swine erysipelas in the United States, W. T. SPENCER (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 774, pp. 229-232).

Tularemia in dogs, L. F. EY and R. E. DANIELS (*Jour. Bact.*, 42 (1941), No. 1, p. 146).—Report is made of an accidental tularemia infection in the field in which three canines and a human were involved. The dogs became infected through eating portions of an infected rabbit.

Horse and mule production, W. W. DIMOCK. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 770, pp. 369-380).—Disease problems encountered in horse and mule production are considered.

Susceptibility of horses to St. Louis encephalitis virus, H. R. COX, C. B. PHILIP, and J. W. KILPATRICK (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 27, pp. 1391-1392).—Studies in which three horses were injected intracerebrally with St. Louis encephalitis virus 330,000 m. l. d. for mice have clearly demonstrated that horses are susceptible to this virus, that it produces clinical symptoms in horses similar to western equine encephalomyelitis virus, that it may be recovered from the brain, spinal cord, and nasal washings of infected animals, and that it may be transmitted from one horse to another by intracerebral injection of infected brain tissue. Horses that show antibodies for western equine encephalomyelitis virus in high titer are susceptible to St. Louis encephalitis virus, while horses that have acquired St. Louis encephalitis antibodies by natural processes are apparently resistant to subsequent infection.

Distribution of the vectors of equine encephalomyelitis in Massachusetts, R. F. FEEMSTER and V. A. GETTING (*Amer. Jour. Pub. Health*, 31 (1941), No. 8, pp. 791-802, figs. 6).

Encephalitis in Minnesota, W. A. RILEY. (Minn. Expt. Sta.). (*Minn. Med.*, 24 (1941), No. 8, pp. 666, 706).—Minnesota mosquitoes that have been proved capable of transmitting equine encephalomyelitis under laboratory conditions are noted, namely, *Aedes vexans*, *A. triseriatus*, *A. nigromaculis*, *A. dorsalis*, and *A. atropalpus*. It is concluded that of the 23 species of this genus represented in the mosquito fauna of Minnesota, *A. vexans* comes the nearest to meeting the requirements of a good vector of equine encephalomyelitis.

Survival and development at low temperatures of eggs and preinfective larvae of horse strongyles, J. T. LUCKER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 4, pp. 193-218).—Following a brief review of the literature and a discussion of the methods and procedure employed, the results of laboratory and outdoor experiments with eggs and with preinfective larvae at Beltsville, Md., are reported, the details being given in tables. In the laboratory experiments from 94 to 100 percent of unembryonated horse strongyle eggs in feces continuously exposed to mean temperatures of about 14° to 21° F. were killed in from 47 to 56 days. In one experiment 0.4 percent of the eggs survived continuous exposure for 97 days to a mean temperature of 16°. Cultures that originally contained unembryonated eggs and that were potentially capable of yielding large numbers of infective larvae yielded very few when subjected to alternate freezing and thawing, each period of thawing at room temperature being of sufficient duration to permit some degree of development. In one experiment 0.5 percent of the eggs in feces kept at a mean temperature of 36° survived for 195 days; in two of three experiments about one-half of the eggs survived for 3 to 4 weeks at this temperature. More than 90 percent of preinfective larvae, mainly first and early second stages, were killed by 1 to 4 days of exposure to mean temperatures of about 14° to 21°. Larvae in more advanced preinfective

phases were similarly susceptible. About 90 percent of larvae, mainly in the first and second stages, died in about 3 mo. in feces kept at approximately 36°; death was apparently due to starvation. In cultures originally containing mainly larvae in the second ecdysis and advanced phases of the second stage the number and proportion of infective larvae increased during prolonged exposure to a similar mean temperature. After 3 mo. of exposure the survivors represented 40 to 100 percent of the total number of all stages present originally. When feces containing unembryonated eggs were exposed outdoors to winter and early spring temperatures near Beltsville some infective larvae developed during the winter. The yield of such larvae in the spring from feces so exposed was reduced to a small fraction of the original or potential yield. This reduction resulted mainly because many of the preinfective larvae hatching from the eggs during warmer periods were killed by low temperatures that followed. Infective larvae also developed in winter in feces that contained preinfective larvae when placed outdoors, but the ultimate yield was sharply reduced as compared with the potential yield. During the experiments in which these results were obtained temperatures fluctuated above and below the freezing point frequently and such transitions often were rapid.

It is concluded that the degree of the lethal effect of outdoor exposure in winter and spring depends on the relationships that prevail between the variables of temperature and time.

Experimental observations on phenothiazine relative to the treatment of equine strongylosis. R. H. KNOWLES and W. P. BLOUNT (*Jour. Roy. Army Vet. Corps*, 12 (1941), No. 2, pp. 51-65).—In the experiments reported, phenothiazine in doses of 30 gm. (0.066 gm. per kilogram per 1,000-lb. horse) was 100 percent efficient in the treatment of equine strongylosis. It was found to be nontoxic in therapeutic doses; it is not a purgative, nor are accessory purgatives required for its effective action, as it is both a vermicide and vermifuge. Administration is simple, and it causes very little interference with the normal diet and work. It is inexpensive and supersedes all other forms of treatment for strongylosis in equines.

Is phenothiazine poisonous to horses? H. SCHMIDT, T. T. CHRISTIAN, and W. M. SMOTHERMAN. (Tex. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 774, pp. 225-228, 229).—Report is made of cases considered to indicate that there is need for more and especially more precise information as to the effect of phenothiazine upon equines treated with this anthelmintic.

Effects of sulphur on growing chickens. D. J. CABRERA (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 2, pp. 89-97).—The effects of sulfur on growing chicks, with special reference to its influence on the weight of the birds, are reported. Continuous feeding of sulfur in the amount of 2 percent, by volume, of the ration to 3-week-old and 8-week-old chicks for a period of 22 and 44 days, respectively, proved definitely harmful, and this harmful effect was more manifest in the younger than in the older birds. The difference in response between the 3-week-old and the 8-week-old chicks with reference to this toxic effect of sulfur may be due either to the stronger physical constitution of the latter or to the more efficient conversion of sulfur into H₂S in the intestine of the former. It is considered probable that the parasitocidal activity of sulfur in avian coccidiosis is due to its conversion into hydrogen sulfide which renders the reaction of the intestinal canal, including the cecal portion, acid, a condition which seems to be detrimental to coccidial growth and reproduction within the gut.

Mortality in egg-laying trials in Great Britain during the period 1929-1937. F. J. DUDLEY, N. DOBSON, and R. F. GORDON (*Vet. Rec.*, 53 (1941), No. 23, pp. 323-330, fig. 1).—The study reported, the details of which are given in 10

tables, has revealed an increase in the mortality rate of fowl entered at county laying trials in Great Britain from 6.24 percent in 1929 to 17.24 percent in 1937. The deaths were in large part due to diseases of nonspecific type, with specific infections and internal parasites of relatively little importance. The most frequent cause of death was failure or break-down of the reproductive system, followed by disease of the liver, visceral gout, and respiratory disease. In recent years there has been a great increase in the incidence of lymphomatosis, which in the last year probably constituted the largest single cause of death.

A study of the C factor as a requirement for growth of *Hemophilus gallinarum*, J. P. DELAPLANE and H. O. STUART. (R. I. Expt. Sta.). (Jour. Agr. Res. [U. S.], 63 (1941), No. 1, pp. 29-30).—It is pointed out that the so-called C factor requirement for the growth of *H. gallinarum*, the cause of fowl coryza, was reported upon by B. H. Kessens in 1936 and by Delaplane et al. in 1938 (E. S. R., 79, p. 686). They found that the C factor requirement for growth of this organism in chicken blood serum is adversely affected when heated at 90°-100° C. for 10 min. The present authors have shown this factor to be of a physical rather than of a chemical or nutrient nature. Chicken blood serum or plasma heated or boiled in an alkaline solution such as a 2 percent sodium citrate normal salt solution resulted in the proteins remaining in suspension and supported good growth of *H. gallinarum*. The cultures of *H. gallinarum* used in the studies required only the X and V factors rather than the X, V, and C factors.

Pendulous crop in turkeys may be successfully treated by operation, W. BINNS (Farm and Home Sci. [Utah Sta.], 2 (1941), No. 3, pp. 8-9, figs. 6).—The station has found that by removing a portion of the crop of affected turkeys by surgical operation 85 percent of those badly affected can be saved and sold as prime or choice birds. The operation requires about 15 min. for each bird, and but few surgical instruments are needed. The method of procedure is described. Reference is made to the work of Hinshaw and Asmundson (E. S. R., 74, p. 857; 80, p. 177).

***Hexamita meleagridis* sp. nov. from the turkey, E. McNEIL, W. R. HINSHAW, and C. A. KOFOID. (Univ. Calif.). (Amer. Jour. Hyg., 34 (1941), No. 2, Sect. C, pp. 71-82, fig. 1).**—Under the name *H. meleagridis* description is given of a diplozoic flagellate from the intestines of turkeys. It measures 6 μ to 12 μ (average 9 μ) by 2 μ to 5 μ (average 3 μ). This organism causes a severe catarrhal enteritis in turkey poults. A review of reported work indicates that other members of the genus *Hexamita* cause a similar enteritis in young fish and in young pigeons. Cross-infection experiments indicate some degree of host specificity. *H. meleagridis* was transmitted to young quail, chicks, and ducklings, and it is pointed out that while the disease was not reproduced in any instance this does not preclude the possibility of these birds being carriers. The species in quail and chukar partridge were transmitted to turkey poults, but *H. columbae* was not. A review of the literature relating to *Hexamita* as a pathogenic agent, including a four-page list of references, and a host-parasite table are included.

A new dilepidid tapeworm from a cardinal, L. O. RODGERS. (Okla. A. and M. Col.). (Amer. Micros. Soc. Trans., 60 (1941), No. 2, pp. 273-275, figs. 4).—A dilepidid cestode, 13 specimens of which were found in the small intestine of 1 of 12 cardinals (*Cardinalis cardinalis cardinalis*) collected near Stillwater, Okla., in the spring of 1940, is described as new under the name *Anonchotaenia rostellata*.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Texas Station] (Texas Sta. Rpt. 1940, pp. 120-123).—Under the general head of mechanical harvesting of

cotton, snapping qualities of cotton bolls, spread of open cotton bolls, green-leaf studies, and plant characteristics are reported upon by H. P. Smith, D. T. Kil-lough, D. L. Jones, and M. H. Byrom. Notes on efficiency in distribution and placement of cottonseed and fertilizer includes data on machine placement of fertilizer and soil-disturbance studies, width of furrow openers, effects of press wheels, and hill dropping of cotton. Treatment of cottonseed for planting purposes, and atmospheric exposure of wire and fencing are dealt with by Smith and Byrom. Garlic drying is reported upon by Smith, Byrom, and G. E. Altstatt.

Lining a leaky irrigation canal with clay saves both water and soil: Water lost from unlined canals would irrigate many additional acres, O. W. ISRAELSEN. (Coop. U. S. D. A. et al.). (*Farm and Home Sci. [Utah Sta]*, 2 (1941), No. 3, pp. 3, 10, figs. 2).—In canals carrying an average flow of from 23 to 72 sec.-ft. the average seepage losses were found to be from 2.1 to 10.7 percent per mile, justifying a lining cost of from 1.8 to 8.9 ct. per square foot on the basis of the water saving effected. A further advantage was found in the lowering of water tables in the vicinity of the canals with resultant diminution of the risk of alkali damage. The average cost of lining with suitable clays was about 3 ct. per square foot. Studies of the available materials showed that some of the clay soils of the area are sufficiently low in permeability to justify their use in lining canals to prevent seepage losses, whereas some soil materials which irrigators thought might be good are so high in permeability as to be of little or no value for lining canals. Hand tamping and tractor-driven roller compaction were both used in an experimental lining of a 4,000-ft. section of a canal showing a high rate of seepage loss. This canal showed coefficients of permeability ranging from 30.4 to 65,000 ft. per year. After the completion of a lining of 3 in. of Oasis clay covered with from 0.5 to 1 in. of gravel, the permeability coefficient became reasonably constant and had an average value of 0.124 ft. per year. Several days' operation of the canal at its maximum capacity of 150 sec.-ft. beginning a few days after completion of the lining did not cause serious lining erosion, and after 1 mo. of operation a large part of the lining had resisted erosion.

Cost of power farming: Its improvements and work accomplishments, T. E. LONG (*North Dakota Sta. Bul. 305* (1941), pp. 15, figs. 5).—This popular bulletin discusses the factors influencing kind and type of farm machinery used; the changes in quality values; improvements that have been made in machinery; and costs of operation, daily duty, and draft requirements of different machines and implements. Tables show the increase since the period 1910-14 in efficiency, durability, economy, etc., of different implements; the average acreage handled per hour, fuel requirements and costs of operation of tractors of different drawbar horsepower with different kinds and sizes of machinery; and the acreage that can be handled per 10-hr. day, and the draft requirements of different kinds and sizes of machinery.

Poultry housing conditions in Missouri, E. M. FUNK (*Missouri Sta. Bul. 431* (1941), pp. 11, figs. 3).—A study of housing conditions in 7,104 National Poultry Improvement flocks in Missouri in 1939 and 1940 led to the conclusion that adult chickens in laying houses should be allowed from 3 to 4 sq. ft. per bird. It also appeared important that the floor be constructed of concrete or other materials which may be thoroughly cleaned and may furnish weather protection. Square houses varied from 8 by 8 ft. to 40 by 40, but most of them ranged between 20 by 20 and 30 by 30. Many had earth floors. Many of the poultry houses needed remodeling because they were too narrow for best weather protection.

AGRICULTURAL ECONOMICS

Research in international economics by Federal agencies, S. SCHWARZ (*New York: Columbia Univ. Press, 1941, pp. XXXIX+357*).—Part 1 describes the activities of the various executive departments and other agencies of the United States. Part 2 is an inventory covering the period 1933-40 of American official researches bearing upon international economic relations. It is presented in sections on the structure of national economy, the structure of international economic organization, and international economic relations. A finding list of Government publications is included.

[Investigations in farm and ranch economics by the Texas Station, 1940]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1940, pp. 93-100*).—Brief general findings in the following studies are reported: Operating costs and financial conditions of gins in Texas, by W. E. Paulson and L. P. Gabbard, including formulas based on volume of ginning, fixed costs, gin income per bale, variations in costs per bale, and profits; a study of the marketing of turkeys in Texas, by Paulson, including data on average weights, effects of weight and season on prices, etc.; factors affecting the equitable assessment of rural and urban property in Texas, and factors affecting the collection and expenditure of taxation revenues in Texas, by H. C. Bradshaw and Gabbard; and the economic significance of different farm leasing systems in Texas, by J. R. Motheral and Gabbard.

Delaware farm production and prices, C. E. BURKHEAD and R. O. BAUSMAN. (Coop. U. S. D. A.). (*Delaware Sta. Bul. 230 (1941), pp. 90, fig. 1*).—Tables by years, beginning as early as 1840 in some cases, show the acreages, production, price, value and sales of grain, hay, potatoes, sweetpotatoes, truck and cannery crops, and fruit crops; the number, production, price, value, and sales of livestock and livestock products; monthly prices of crops, livestock, and livestock products; indexes of prices received and prices paid by farmers, and farm income; number of farms, acreage in farms, and value of farm real estate; and farm wage rates, supply and demand for farm labor, and weather data.

Should farmers emphasize wheat or livestock in north central South Dakota? A. G. NELSON and G. E. KORZAN (*South Dakota Sta. Cir. 33 (1941), pp. 16, figs. 7*).—Analysis is made of continuous records kept by 30 farmers from 1932 to 1939. The findings are based chiefly on the records from 10 "wheat" farms with the following averages per farm—total acreage 928, crop acreage 661, wheat acreage 321, number of animal units of roughage-consuming livestock 29.5, and number of animal units of concentrate-consuming livestock 7; and 10 "livestock" farms (with the following averages)—total acreage 998, crop acreage 446, wheat acreage 82, animal units of roughage-consuming livestock 49.8, and animal units of concentrate-consuming livestock 8.2. Tables show by years the average land use and livestock organizations, and the receipts, expenses, operator's labor income and earnings, etc., for each group of farms, and the standards used in calculating the budgets. The possibility of higher wheat prices in the future is discussed. A table shows the calculated operator's labor income, 1932-39, for the two groups, of farms with nine combinations of yields and prices, with assumption (1) that wheat sells at a premium over other grains, and (2) that it sells at the same price as other grains.

The annual operator's labor income for the wheat farms varied from \$755 to -\$1,607, averaging -\$460, and those for the livestock farm varied from \$1,645 to -\$1,920, averaging -\$152. The authors state that (1) wheat and livestock production in the area will be about equally profitable if "average" yields of wheat are obtained and the price of wheat is relatively high compared to the

price of feed grains as in the past; (2) if the price of wheat is not above that of feed grains the livestock production will be the more profitable regardless of wheat yields; (3) wheat production will probably be materially reduced if wheat production and prices are not supported by government policies and programs; and (4) capital investment is greater for livestock than wheat farms and, therefore, for operators to be able to shift to livestock more credit will be required.

Profits and losses in ranching, western South Dakota, 1931-1940, A. G. NELSON and G. E. KORZAN (*South Dakota Sta. Bul. 352 (1941), pp. 31, figs. 15*).—This bulletin, which applies specifically to the northwestern part of the State and generally to the western part, is based on data collected from operators in the northwestern part of the State. Tables show by years 1931-40 the average receipts, expenses, and income per animal unit; the average number of animal units on 4 cooperating ranch farms and 10 ranches; range conditions by months, operator's labor income (1932, 1936, and 1939); and summaries by years of cash receipts, expenses, income, tenure, and use of land and the livestock organization of a cattle ranch (1926-40), a cattle-sheep ranch 1931-40, a sheep ranch 1933-40, and a ranch-farm 1931-40. The factors contributing to higher income, size of land unit required to support a family, and an example of a profitable ranch of each type are discussed.

Moderately large units, if well managed, careful buying and selling, well blocked-out units, good ranges including water supply, a flexible organization, reserves of money and feed for poor years, large calf and lamb crops, low death rates, and supplementary enterprises were factors contributing to larger incomes. Under average conditions with little or no income from supplementary enterprises, approximately 3,400 acres in the better areas and 6,500 acres in the moderately poor areas were required to support a family. In selected areas where farming can be carried on profitably 640-960 acres were required.

Foreign Agriculture, [September-October 1941] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 5 (1941), Nos. 9, pp. 351-396, figs. 4; 10, pp. 397-441, fig. 1*).—No. 9 consists of an article on French West Africa, by P. K. Roest, in which the physical features of the area, the people, land utilization, agricultural production, industry, trade, transportation, government policies and assistance to agriculture, trade, and private enterprises are discussed. No. 10 includes the following articles: *The Russo-German War and Soviet Agriculture*, by L. Volin, discussing the effects of World War II on the agriculture of Russia, and making comparisons with the conditions during World War I; *Agricultural Policies in Unoccupied China Since 1937*, by O. L. Dawson, describing and discussing the measures following the outbreak of hostilities between China and Japan, the reorganization of the agricultural structure, the programs for expanding agricultural production, the general agricultural improvement measures, and measures for food, export, and import control; and *Food Rationing in Germany*, by J. H. Richter, discussing the consumption of different foods during the first 2 yr. of World War II, and making comparisons with World War I.

The sale price and assessed value of farm real estate in South Carolina, G. H. AULL (*South Carolina Sta. Bul. 334 (1941), pp. 42, figs. 5*).—This study is based on records in county clerks' offices, supplemented by records of the county treasurers or auditors. The 29,933 records covered the years 1900-1937 with 498 before 1900, and were for voluntary "true consideration" sales in 44 of the 46 counties of the State. The records were classified to show the year of sale, county, type of owner (seller), size of farm, sale price per property and per

acre, and the ratio of assessed value to sale price. The tax system and the assessment practices of the State are described.

Of the total assessments in the State, country real estate constituted nearly one-third, all real estate more than one-half, mills and textile properties including real estate not otherwise classified nearly one-fifth, and public utilities one-fifth. In 1939 rural real estate carried 30.55 percent, and urban real estate 22.25 percent of the total. The yearly ratios of total assessed value to total sale price averaged 30 percent, and varied from 111 percent in 1902 to 17 percent in 1920, and was 46 percent in 1937. The average ratios for the several counties varied from 20 to 90 percent. The average ratios by type of seller were: Individuals 29 percent, administrators, executors, or guardians 28, insurance companies 33, mortgage or land investment companies 24, Federal Land Bank, Commissioners, and Joint Stock Land Banks 49, other banks or trust companies 34, and all others 31 percent. The ratios increased from 22 percent for farms of less than 25 acres to 27 percent for farms of 50-99 acres and to 39 for farms of 500 acres and over. The ratios for properties with different sales prices were: Less than \$1,000, 69 percent; \$1,000-\$2,499, 39 percent; \$2,500-\$4,999, 27 percent; and then gradually decreased to 16 percent for those selling at \$20,000 or over. The study showed 31 percent of the farm properties were assessed equitably, 43.2 percent were overassessed, and 25.8 percent underassessed. The average sale prices, assessed values, and the equalized assessment (30 percent of sales price) for farms selling at different prices are shown in the following table:

Sale price, assessed value, and equalized value of farms grouped according to sale price per acre

Sale price group (dollars per acre)	Average per acre		
	Sale price	Assessed value	Equalized assessment
Less than 10.00.....	\$4.82	\$4.62	\$1.45
10-19.99.....	13.71	6.18	4.11
20-29.99.....	23.85	7.41	7.16
30-39.99.....	33.63	8.42	10.09
40-49.99.....	43.42	9.59	13.03
50-74.99.....	58.39	10.91	17.52
75-99.99.....	84.19	13.14	25.26
100 and above.....	151.15	16.97	45.34
All groups.....	23.10	6.85	6.85

The location of heirs and the value of their inheritances: Farm and city estates, E. D. TETREAU. (Ariz. Expt. Sta.). (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 4, pp. 416-429).—The probate records for about 400 farms and 300 city estates in 2 Ohio counties and 1,100 farms and 1,800 city estates in 2 Arizona counties were examined. An analysis is made of the number and location of the heirs and the composition and divisions of the estates. The following conclusions are reached:

"It seems generally to be true that the flow of rights in farm estates cityward on account of the migration of heirs of farm estates very greatly exceeds the flow of rights in city estates countryward, which is attributable to the countermovement of heirs of city estates; . . . a spatial centralization of property operates through inheritance and exceeds its spatial dissipation on account of migration; . . . [and] a definite tendency for rights in property that has been recently acquired and at some distance from the family's more permanent location to flow back to the place of origin by inheritance."

Experience of Michigan rural banks with short term loans to farmers, R. J. BURROUGHS, with collab. of H. S. PATTON (*Michigan Sta. Spec. Bul. 311* (1941), pp. 80, figs. 4).—This study, which has been previously described briefly (E. S. R., 86, p. 103), is based chiefly on loan records of 900 farmers in 9 rural banks in 9 representative counties for the period 1928-36 or 1937, and on replies from 110 banks to a questionnaire. Analysis is made of the types and size of the farms, tenure of borrowers, size and purpose of and security for loans, terms of and interest charges on notes, seasonal and cyclical variations, and the degree of liquidity of loans, and the factors affecting liquidity. Comparison is made of loans to farmers and other loans and investments.

For most of the banks there was no marked seasonal variation in the volume of outstanding loans to farmers. The indexes of the aggregate balances owed by 382 "continuous customers" in 8 of the banks studied declined from 136 in 1928 to 69 at the end of 1934 and then rose irregularly to 89 at the end of 1937. The losses on loans to farmers were relatively few and small. Only 20 of the 110 banks replying to the questionnaire reported heavier losses on loans to farmers than on those to other borrowers, while 64 percent reported smaller losses on loans to farmers. The analysis of 2,283 separate loans by the 7 banks studied in detail showed approximately one-seventh repaid within 1 mo., two-fifths within 3 mo., two-thirds within 6 mo., and six-sevenths within a year. Of the 305 "slow" loans 45 percent were paid within 2 yr., and in 25 cases total liquidation took 5-7 yr. Forty percent of the loans were renewed once or more. Loans to livestock feeders and fruit growers were paid in a shorter period than those to general farmers or dairy farmers. Loans for seasonal production purposes were paid more rapidly than those for the purchase of feeder livestock or for purchase of machinery, automobiles, and building improvements. The smaller the amount of obligations up to \$500, the higher the proportion that was repaid within a given period. Payments were made within 12 mo. on 82 percent of the loans made in 1928, on 70 percent of those made in 1931, and on 95 percent of those made in 1933 through 1935. Of 2,869 loans by 7 of the banks, 57 percent had no endorser or collateral, 20 percent had an endorser, frequently the wife of the maker, and about 11 percent were secured by chattel mortgage. The nominal rate of interest was usually 6-7 percent, but the actual rate was often higher on small loans due to a minimum charge.

State rural land-use legislation in 1940, K. WERNIMONT. (U. S. D. A.). (*Jour. Land and Pub. Util. Econ.*, 17 (1941), No. 1, pp. 103-108).—The laws enacted in 1940 are summarized and a note is made of some bills that failed to be enacted.

Policy for use of State-owned land in Arkansas, O. J. HALL. (Ark. Expt. Sta.). (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 4, pp. 470-474).—The past policies are briefly described and the new policy inaugurated in 1939 under Act 331 of the Arkansas General Assembly is discussed.

Centralization and coordination of police power for land-control measures, V. W. JOHNSON and H. WALKER, JR. (U. S. D. A.). (*Jour. Land and Pub. Util. Econ.*, 17 (1941), No. 1, pp. 17-26).—"This article proposes to consider the organizational requirements of police power vested in local units of government as a means of regulating rural land uses." The administrative and legislative units are discussed, and a rough draft of a proposed coordinating statute is included.

Land classification in the United States (*Washington: Natl. Resources Planning Bd.*, 1941, pp. VIII+151, pls. 2, figs. 47, [map 1]).—"This report includes (1) a comprehensive exposition of the status, methods, and geographic coverage of land classification in the United States, (2) an interpretation made from

this information, indicating the importance of certain characteristics common to all land-classification work, and (3) a list of general and specific recommendations directed to scientists, administrators, and land-planning technicians."

Farm buildings as evidence of productivity of crop land, P. E. McNALL (Univ. Wis.). (*Jour. Land and Pub. Util. Econ.*, 17 (1941), No. 2, pp. 165-170).—A comparison is made for 165 farms in a township in Barron County, Wis., and 59 of the same farms in 2 smaller areas classified into 5 classes as to productivity and of the buildings classified into 3 classes as to total first cost, present condition, and expense of upkeep. A comparison is also made for 129 farms as to the relation of soil productivity and character of buildings to farm income. None of the farm building classifications showed definite relationships to soil productivity.

Comparative labour efficiency in agriculture, O. J. BEILBY (*Empire Jour. Expt. Agr.*, 9 (1941), No. 34, pp. 137-144).—Some statistical information is brought together on the efficiency of labor. Tables are included and discussed, showing the home production exports and reexports, imports and home consumption of food supplies, and the value of output per agricultural worker in New Zealand, Australia, Eire, Canada, the United States, and Great Britain; and the number of persons fed per agricultural worker, and the value of output per 100 acres and per worker in the six countries above, and Denmark, the Netherlands, Belgium, Switzerland, France, and Germany.

Agriculture's requirements for transportation in 1941, E. O. MALOTT and W. E. F. CONRAD (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1941, pp. [2]+III+66, figs. 3).—This report deals principally with rail transportation of grain, with some discussion of motor and water carrier transportation and grain storage. Possibilities of increasing rail transportation through car service organization, heavier loadings, short routings, equipment and operation, and removal of State barriers to full utilization of facilities; the factors distorting estimates—weather, labor conditions, and production of consumer goods; and adequacy of the boxcar supply are discussed. The appendixes include statistics as to boxcar supply and utilization, car loadings, production and marketing of grain, the grain storage situation, motor trucks—limitations on use, type, capacity, ownership, use, etc., and the freight movements in intercoastal commerce and on the Great Lakes and Mississippi River and its tributaries.

Proceedings of the annual meeting of the New England Research Council on Marketing and Food Supply (*New England Res. Council Market. and Food Supply Proc.*, 1940, pp. [91], figs. 6).—Included are the following papers and discussions presented at the annual meeting at Boston, Mass., on April 24 and 25, 1940: An Appraisal and Evaluation of Research in New England Now Under Way or Recently Completed, by F. Griffiee (pp. 1-24); Review of Work Completed and Present Status of the Country Plant Study, by R. G. Bressler, Jr. (pp. 25-28) (Univ. Conn.); Plans for Preparation of a Report on the Supply Side of New England Milk Markets, by A. MacLeod (pp. 29-30); Should the Emphasis of the New England Milk Marketing Research Program Be Changed? by H. B. Rowe (pp. 33-36); Report of a Study on Consumer Preferences for Potatoes in the Boston Market—I, Sampling Procedure Used in the Study of Consumer Preferences for Maine Potatoes in Part of the Metropolitan Boston Area (pp. 37-50), II, General Opinion of Enumerators as to Consumer Preferences for Potatoes (pp. 50-53), by M. A. Hincks (Maine Expt. Sta.); and The Use of Agricultural Surpluses To Overcome Nutritional Deficits, by A. C. Hoffman (pp. 57-67), The Marketing Research Program of the Bureau of Agricultural Economics and Its Relationship to the Work of the Experiment Stations, by H. R.

Tolley (pp. 71-73), and *The Coordinated Program of Poultry and Egg Marketing Research in the North Central States*, by G. W. Sprague (pp. 76-80) (all U. S. D. A.). The reports of the dairy, fruit and vegetable, and poultry committees, with discussions and other data are also included.

What recent surveys in New York City have shown us about retailing fruits and vegetables, M. P. RASMUSSEN. (Cornell Univ.). (*Natl. League Wholesale Fresh Fruit and Veg. Distrib. Proc.*, 49 (1941), pp. 30-64).—Some of the findings in studies of the [New York] Cornell Experiment Station in New York City are presented. Tables are included and discussed showing the number of different types of food stores, amounts of fruit and vegetables handled, sales and incomes by types of stores, relation of family income to annual purchases, quantities of different vegetables sold, percentages of consumers' expenditures for different vegetables and fruits, gross retail margins on fruit sales, proportion of retail fruit outlets in different family income areas not handling specified fruits, the number of commodities, fruit and other, handled by retailers, prices in different income areas and of different types of retailers, etc.

Marketing Ohio tomatoes to processors on grades, 1930-1940, C. W. HAUCK (*Ohio Sta. Bul.* 623 (1941), pp. [2]+26, figs. 8).—This study, which covers the years 1930-40, inclusive, during which Ohio processors have purchased tomatoes on government grade and inspection, supplements Bulletin 504 (E. S. R., 68, p. 115) and University Mimeograph Bulletin 82 (E. S. R., 74, p. 718). The importance of the tomato canning industry in the State, the buying practices of processors, the volume of tomatoes purchased on grade and inspection, the quality of tomatoes inspected, the relation of quality to acreage grown by individuals, and the prices and value of raw stock and standard tomatoes in No. 2 cans are discussed.

The number of packing companies buying on grade increased from 5 in 1930 to 41 factories operated by 25 companies in 1940. The volume of tomatoes so purchased increased from 9,000 tons to 96,000 tons. For the years 1930-33 the percentages of U. S. No. 1 grade tomatoes ranged from 52 to 63 percent, of U. S. No. 2 grade from 28 to 39 percent, and culls from 7 to 13 percent, as compared with 53-71, 24-41, and 5-7 percent, respectively, for the years 1934-40. The author states that "despite inadequacy of the information available on certain aspects of this method of marketing tomatoes, it can be appraised in general as a decided improvement over the former flat-rate method. Standardization is encouraged. Unbiased and accurate evaluation of the goods delivered is assured. Payment is proportionate to quality, and this relationship promotes better cultural and handling practices, reduces deliveries of low-grade tomatoes, and permits economies in handling and in manufacture. Further extension of the plan is recommended, but greater uniformity in rates of payment seems desirable."

Prices of apple varieties as a factor in variety selection, M. D. WOODIN ([*New York*] *Cornell Sta. Bul.* 761 (1941), pp. 20, figs. 23).—Tables and charts are included showing the relations of prices of different varieties of apples and wholesale prices of farm products, production and wholesale prices in New York City, and purchasing power of apples, etc. The effects of variety, yields, and the trends on prices of different varieties, are discussed.

Seven decades of milk, J. J. DILLON (*New York: Orange Judd Pub. Co.*, 1941, pp. XII+340, [pl. 1]).—This history of the New York dairy industry deals chiefly with distribution and prices of milk.

Farmers' elevator operations in South Dakota, L. M. BROWN and H. HEDGES. (Coop. U. S. D. A.). (*South Dakota Sta. Bul.* 351 (1941), pp. 39, fig. 1).—The findings are based on a general survey of farmers' cooperatives in the United

States made during 1937 by the Farm Credit Administration in cooperation with the State agricultural experiment stations, and a continuation of this study by the station for the years 1936-37 to 1938-39. Analysis is made of the capital investment, members' equity, current and total assets and liabilities, surplus, income, expenses, factors affecting volume of business, receipts, expenses, income, unit costs, etc., the outlets for grain, and the sales methods. In many of the analyses the elevators are grouped into those in the southeastern part of the State and those in the northern and western part. In the analysis of factors affecting operating results, membership and patronage, membership as a volume of business factor, business volume, grain and sideline margins, price trends, and hedging are considered, and in the analysis of unit costs of operation, volumes of grain and sidelines, business, and labor and plant utilization are taken up. The appendix includes a brief description of the farmers' elevator movement and cooperative laws of the State.

Organization and use of Alabama locker plants in 1941, W. K. McPHERSON (*Alabama Sta. Spec. Cir., Aug. 1941, pp. 19, figs. 4*).—This circular is based chiefly on answers to a questionnaire presented to locker operators in May 1941. The number, location, types, ownership, capacities, services offered, number of patrons, kinds of products stored, sources of products, etc., and the factors contributing to success, the present status, and the possibilities of future developments of lockers, are discussed. There were found 19 installations in the State, with 2,286 lockers, of which 1,629 were rented, 54 percent by farmers.

Farm price facts for North Dakota, 1941, W. L. ERTESVOLD (*North Dakota Sta. Mimeog. Cir. A1 (1941), pp. [1]+19, figs. 2*).—This is a presentation of a supplement to a study of farm prices and farm price relationships in North Dakota (E. S. R., 86, p. 115).

Index numbers of production, prices, and income, 1941, J. I. FALCONER (*Ohio Sta. Bimo. Bul. 212 (1941), p. 174*).—The usual table (E. S. R., 86, p. 104) is brought down through July 1941.

Ohio agricultural statistics, 1939, G. S. RAY, O. M. FROST, and P. P. WALLRABENSTEIN. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 621 (1941), pp. [2]+59, fig. 1*).—Statistics similar to those for 1938 (E. S. R., 83, p. 688) as to the different field crops, hay, fruits, commercial truck crops, livestock and livestock products, poultry and poultry products, farm wages, farm labor supply and demand, prices received by farmers on December 15, and estimated gross cash income from sales of products, are included.

Trends in the consumption of fibers in the United States, 1892-1939, R. B. EVANS and R. F. MONACHINO (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin., 1941, ACE-93, pp. [2]+92, figs. 10*).—"This report presents statistical data on the consumption of textile and cordage fibers in the United States during the years 1892-1939 and a discussion of trends in fiber consumption during this period. Fibers considered are cotton, wool, and similar fibers (including mohair, camel's hair, etc.), silk, rayon, flax, jute, the various hard fibers, and hemp. Trends are discussed separately on the basis of mill consumption of raw fibers and on the basis of final consumption of fibers by ultimate consumers."

Crops and Markets, [September 1941] (*U. S. Dept. Agr., Crops and Markets, 18 (1941), No. 9, pp. 197-220, figs. 2*).—Included are the usual crop and market reports.

RURAL SOCIOLOGY

Training and recruiting of personnel in the rural social studies, T. W. SCHULTZ, assisted by L. W. WITT (*Washington, D. C.: Amer. Council Ed., 1941, pp. XIII+340*).—The authors were aided in this study by an advisory com-

mittee consisting of E. G. Nourse, W. E. Grimes, W. I. Myers, T. L. Smith, and O. C. Stine, and the economists and sociologists in the land-grant colleges and universities, Federal officials, and many others. In connection with the study of the training and recruiting of personnel in the land-grant colleges and the Federal Government, the authors discussed departmental and institutional organizations, the financial resources available to agricultural economics and rural sociology, personnel resources, personnel and financial resources in the Federal service, incoming and outgoing personnel of professional rank and the training and recruiting of professional and scientific staff, of the U. S. Department of Agriculture.

The development of country life studies at the University of Wisconsin, H. C. TAYLOR (*Rural Sociol.*, 6 (1941), No. 3, pp. 195-202).—Rural sociology at the University of Wisconsin had its beginnings in the Department of Agricultural Economics in 1911. The work and publications of C. J. Galpin during the ensuing 8 yr. are emphasized in this account.

The application of fundamental concepts in rural community studies, R. HEEBEELE. (La. State Univ.). (*Rural Sociol.*, 6 (1941), No. 3, pp. 203-215).—"Rural community studies are concerned with two main problems: The delineation of the area to be considered as a community and the inquiry into the quality of solidarity in this group. The latter task involves the use of theoretical concepts such as Tönnies' 'Gemeinschaft' and 'Gesellschaft.' In this theory the old farm-village community represents a prototype of Gemeinschaft. The rural community studies based on the 'service area' method are concerned with social groupings essentially on the level of Gesellschaft. Through application of Tönnies' theory, the Gemeinschaft elements present in contemporary American rural communities can be determined. Many apparently insignificant traits will acquire a new meaning as indicators of the prevailing sociological structure."

Measuring attitude toward rural and urban life, F. H. FORSYTH. (U. S. D. A.). (*Rural Sociol.*, 6 (1941), No. 3, pp. 234-241).—"To measure the present status of pro-rural, or pro-urban sentiment, and provide a basis for later study of other phases of present-day personality of farm people, a scale was constructed and standardized, using the Likert method. Some preliminary findings with this scale include: (1) A group of farmers of advanced age scored far more pro-rural than the most pro-rural of the student groups; (2) a group of teachers-in-training was more pro-rural after rural practice teaching than a similar group before practice teaching; (3) a group of delinquents in a large city was more pro-urban than students at the high school in the high delinquency area of the city; (4) Negro city delinquents and Negro college students of rural Southern parentage were distinctly pro-urban; (5) city-residing students in a 'rural' college were nevertheless pro-urban; (6) certain urban sociology students were pro-urban, and rural sociology students pro-rural."

National conference on planning: Proceedings of the conference, Philadelphia, May 12-14, 1941 (*Chicago: Amer. Soc. Planning Off.*, 1941, pp. IX+357).—This report includes the following papers, with discussions, dealing with rural lands: Economic Trends and National Land Policy, by L. H. Bean (pp. 6-17), Land-Use Zoning, by V. W. Johnson (pp. 23-28), The Rural-Urban Fringe, by A. T. M. Lee (pp. 28-37), Progress of Agricultural Planning, by M. L. Wilson (pp. 103-113), and Agricultural Land Planning from the Federal Point of View, by B. W. Allin (pp. 117-122) (all U. S. D. A.); State Land-Use Programs, by M. W. Torkelson (pp. 17-22); Rural Land Planning from the State and Local Point of View, by G. W. Westcott (pp. 122-128) (Mass. State Col.); County Boards of Agriculture, by B. L. Hummel (pp. 128-134) (Va.

A. and M. Col.) ; The New Federal Highway Program, by T. H. MacDonald (pp. 173-179) ; and A Program for the Use of Tax-Abandoned Lands, by C. B. Bennett, T. T. McCrosky, and W. H. Miller (pp. 247-250).

Progress in county zoning: Marathon County, Wisconsin, J. M. ALBERS (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 4, pp. 393-402, figs. 5).—The land use situation in the county, the zoning ordinance of May 4, 1940, and the administration of the ordinance are described.

Extension of urban characteristics into rural areas, E. T. HILLER. (Univ. Ill.). (*Rural Sociol.*, 6 (1941), No. 3, pp. 242-257).—The distribution of chosen data in successive zones or belts of townships surrounding urban centers is tested for indications of extension of urban influences into rural areas. In total 53 areas, or regions, are analyzed, each area consisting of a minimum of four concentric layers of townships surrounding the chosen urban centers. These patterns indicate clear-cut influences of the cities upon their environs, varying, however, with the size of the urban centers.

Population trends and their agricultural implications, D. O. CROSS (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 3, pp. 105-110).—The enormous increase in world population in the last three centuries, estimated at from 545,000,000 to 2,057,000,000, has been due, chiefly, to the saving of lives resulting from improved living conditions and advances in medical science. The level of fertility has been maintained, and until recent years there was an increase in the number of surviving infants, the number of married women, and consequently the number of families. So accustomed has the world become to this population increase that it was expected to persist with its accompanying prosperity due to expansion. Now the outlook is changed. The rate of population increase has been steadily decreasing for some time now in most countries, and the indications are that it will soon cease altogether, the population becoming stationary followed by a decline.

Our aging population, A. R. MANGUS (*Ohio Sta. Bimo. Bul.* 212 (1941), pp. 159-161).—"The population of Ohio, like that of the entire Nation, has passed through its period of rapid growth and is fast getting older. Present indications are that the State and the Nation may soon have a stationary or even a declining population. The slowing growth in numbers is accompanied by an unprecedented concentration of persons in the advanced years of life, with corresponding shortages of children and youth."

The rural youth of Ross County, Ohio.—I, Their education and training; II, Their home, family, and community life; III, Their employment and occupations. (Coop. Ohio Expt. Sta., U. S. D. A., et al.). (*Ohio State Univ., Dept. Rural Econ. and Rural Sociol. Mimeog. Buls.* 140 (1941), pp. [I]+II+[I]+33, fig. 1; 141, pp. [I]+II+[2]+43; 142, pp. [I]+III+[I]+36, fig. 1).—These constitute a series of programs dealing with the rural youth of Ohio.

The challenge to democracy.—II, The citizen and the power to govern, J. H. POWELL (*Iowa Sta. Bul.* P22, n. ser. (1941), pp. 637-651).—This is an educational bulletin in the series previously noted (E. S. R., 85, p. 121), and deals with the nature of democratic institutions, American institutions in particular, the need for constitutional reform, and the problem of defense and war.

The challenge to democracy.—III, The family farm in the machine age, L. B. SCHMIDT (*Iowa Sta. Bul.* P23, n. ser. (1941), pp. 653-668).—The conclusion reached is that the basic principle of a sound agriculture without which we cannot have a sound nation is the widespread ownership of the land.

Social aspects of partnership farming in two North Dakota counties, J. P. GREENLAW and H. L. RICHARDSON (*North Dakota Sta., Rural Sociol. Mimeog. Rpt.* 2 (1941), pp. [3]+IV+27).—This is a presentation of data concerning factors which contribute to the success or failure of partnership farming.

Owner farm families in poor agricultural areas and cropper farm families in rich agricultural areas, D. DICKINS (*Mississippi Sta. Bul. 359 (1941)*, pp. 19, figs. 3).—This study is based upon data concerning income and expenditures of 83 nonrelief white farm owner families residing in poor agricultural areas of Mississippi and 111 nonrelief white sharecropper families residing in the Yazoo-Mississippi Delta. All were young farm families (the wife from 17 to 35 yr. of age), established for at least a year.

An analysis of the income data showed that the owner families had somewhat higher incomes than the cropper families, but that the main difference between the two groups was not so much in the amount of income as in the source. The croppers had a larger proportion of their income in cash from the sale of crops, while the owners had the larger part as farm-furnished foods and cash from work off the farm.

For a given income and family type no significant relation was found between tenure and total value of family living. Such relationship did exist, however, in the matter of housing value and cash expenditure for food and household operation. Landowners in poor soil areas lived in better houses and spent less for food and operation (because more of these products were furnished by the farm) than was the case with the sharecroppers in the rich areas.

A reconnaissance of some cultural-agricultural islands in the South, W. M. KOLLMORGEN (*Econ. Geog., 17 (1941), No. 4, pp. 409-430*).—The establishment, history, and present status of a number of communities in North Carolina, Tennessee, South Carolina, Alabama, Mississippi, Louisiana, Arkansas, and Texas are described.

Neighborhoods and communities of Cumberland County, Tennessee, H. J. BONSER and R. G. MILK (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 129 (1941), pp. IV+20, pl. 1*).—This monograph is designed to help county agents, home demonstration agents, and others working with rural people to deal with them through their communities rather than as individuals. The various neighborhood and community areas of the county are described as to their relationships.

Migration and settlement on the Pacific coast (*U. S. Dept. Agr., Bur. Agr. Econ., Migration and Settlement Pacific Coast Rpts. 4 (1941), pp. [4]+123, figs. 9; 5 (1941), pp. [2]+34, figs. 3; 7 (1941), pp. [2]+14*).—These reports are a part of a broad study of migration to the Far Western States 1930-38.

No. 4. *New farms on new land*, C. P. Heisig and M. Clawson (coop. Oreg. Expt. Sta.).—This is a presentation of the results of a study of two irrigation areas in the Snake River Basin of Oregon. Included are suggestions for the economic development of future reclamation areas with reference to research matters, such as type of farming, size of farm, credit, land and water policies, rate of development, settler selection and settlement process, and technical assistance to settlers.

No. 5. *Cut-over land of northern Idaho* (coop. Idaho Expt. Sta.).—This is a report of recent settlement on the cut-over land of northern Idaho. Of 150 settlers who located on farms between March 1929 and April 1938, 127 own or are purchasing their farms, 12 rent their land, and 11 own some land and rent additional land. There has been a general shift in tenure from farm renter or laborer to farm owner. Detailed information is also given concerning the problems confronting settlers.

No. 7. *Land clearing with the bulldozer*, W. W. Troxell and H. J. Voth.—Results are presented including machines and methods, types of contract, and operating costs of bulldozer equipment used in clearing land for settlers.

Possibility of relocating farmers near Watts Bar reservoir, C. E. ALLRED, H. J. BONSER, R. G. MILK, and J. D. RUSH. (Coop. U. S. D. A.). (*Tennessee*

Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 131 (1941), pp. [I]+II+76, figs. 10.)—This is a discussion of the possibilities of relocation of farmers in this area according to four different assumptions concerning land use.

One hundred new homesteads in the Red River Valley, North Dakota: A study of the resettlement and rehabilitation of farm families, J. P. JOHANSEN. (Coop. U. S. D. A.). (*North Dakota Sta. Bul. 304 (1941), pp. 50, figs. 6.*)—This is a study which describes the families and their situation before and after resettlement, their progress since occupancy, their income, improvements in their standard of living, and their attitudes toward their new homes.

The church and land tenure: Report of conference on how can a church help to stabilize a community by creating a more permanent tenure (*New York: Land Tenure Com. of Town and Country Com., Home Missions Council and Fed. Council of Churches; Chicago: Com. on Land Tenure in Corn Belt, [1940], pp. [4]+102, figs. 14.*)—This report presents material valuable to churches desiring to contribute to improvements in land tenure.

Rural public-welfare administration and finance in New York, E. A. LUTZ (*[New York] Cornell Sta. Bul. 760 (1941), pp. 72, figs. 5.*)—State and Federal disbursements for public welfare in 1938 in New York State were more than \$300,000,000, as compared with approximately \$3,000,000 in 1928. Although local relief costs were at a much higher level in 1938 than in 1928, State and Federal expenditures had increased even more strikingly. A considerable proportion of the State and Federal disbursements was made as grants-in-aid to local governments to help meet costs incurred by them. During 1938 and 1939 the average monthly number of individuals dependent upon public relief, in whole or in part, approximated 2,000,000, or about 15 percent of the 1940 population of the State. An analysis of public-welfare expenditures for 1938 in the 57 up-State counties of New York reveals that not only were the total costs highest in the counties in which the population and the full value of taxable property were greatest, but that expenditures on a per-capita basis also were highest in those counties. The rate of expenditures per thousand dollars of taxable property was approximately as great in the rural as in the urban areas.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Publications and visual information on soil conservation (*U. S. Dept. Agr., Misc. Pub. 446 (1941), pp. [I]+II+30.*)—Procedure for obtaining publications, as well as visual information, on soil conservation is outlined. Publications of regional and general interest are listed.

Forestry in farm management, R. H. WESTVELD and R. H. PECK (*New York: John Wiley & Sons; London: Chapman & Hall, 1941, pp. IX+339, figs. 96.*)—This book "is organized to give students in the agricultural and teachers' colleges, county agricultural agents, teachers of vocational agriculture, and farmers a practical knowledge of the value and usefulness of farm forests, the methods of handling them, and the means of making them real farm assets." The several chapters deal with farm forestry and agricultural economy, trends in farm forestry, growing forest-tree crops—economic basis, growing forest-tree crops—biological basis, how to improve and perpetuate existing farm forests, how to establish new farm forests, protecting farm forests, measuring the volumes of farm-forest products, measuring volumes and growth of farm forests, making trees into the most valuable wood products, marketing farm-forest products, best use of wood on farms, management of farm forests for special products, how farm forests aid wildlife, and farm-forest plans and records. Each chapter includes a list of references. Appendixes include the common and scientific

names of trees; the habits and requirements of important tree species in farm forests in the United States; a chart showing trees attacked, nature of injury, and preventives and control of important insects and diseases; log rules; sample volume tables for red and white oak, cottonwood, Virginia pine, and second-growth loblolly pine; examples of analyzing data for farm-forest plans; forms for farm-forest financial records; and a map showing the location of the Federal forest experiment stations.

Materials for consumer education (*U. S. Dept. Agr., Consum. Counsel Ser. Pub. 10 (1941), pp. VI+42*).—This selected bibliography, compiled by R. S. Hadsell and L. Hemmons, was prepared for the use of U. S. Department of Agriculture workers as a guide to recent publications on methods of consumer education. The material listed is classified under the following headings: Federal Government agencies, courses of study and other teaching aids, correspondence course, study guides for group discussion, the worker as a consumer, cooperative education, recent textbooks, motion pictures and film strips, radio broadcasts, exhibits, consumer playlets, conference proceedings, surveys, materials on the consumer movement, and sources of information.

Film strips of the U. S. Department of Agriculture (*U. S. Dept. Agr., Misc. Pub. 458 (1941), pp. [2]+II+20*).—This is a classified price list, subject to change on July 1, 1942.

FOODS—HUMAN NUTRITION

[**Foods and nutrition research by the Texas Station**] (*Texas Sta. Rpt. 1940, pp. 111-113, 157-158*).—This is a progress report of studies, some of which have been noted elsewhere, on the processing time of canned meat, by S. Cover, H. Schmidt, and R. D. Turk; the mineral composition of vegetables grown in representative regions of Texas and the relation of variation in mineral content to the probable nutritive value, by J. Whitacre, S. H. Yarnell, G. S. Fraps, L. R. Hawthorn, and B. S. Pickett (coop. U. S. D. A. et al.); the effect of tea upon the energy metabolism of children, by Whitacre; and on the blending of grape juices, by H. M. Reed and U. A. Randolph.

Retailer and consumer reaction to graded and branded beef, R. C. ASHBY, R. J. WEBB, E. C. HEDLUND, and S. BULL (*Illinois Sta. Bul. 479 (1941), pp. 337-392, figs. 16*).—This report presents the results of four separate surveys conducted in 1938-39 to learn what grades and brands of beef were handled by Illinois retailers, what the retailers thought about graded beef and branded beef, and what consumers knew about beef.

The retailers handled graded beef because they thought its quality was dependable and uniform; many, but not all, thought the same of branded beef, considering at the same time that it was cheaper than graded beef. Consumers bought graded or branded beef because they associated tenderness, dependable quality, or good flavor with it.

Few of the retailers interviewed made use of the daily price reports issued by the Agricultural Marketing Service, with the result in numerous cases that they paid more than the market price for their meat. Light-weight carcasses (between 338 and 412 lb.) were preferred by most retailers.

Some graded beef was sold to consumers in every income class, although there was a direct correlation between the amount of fat the consumers wanted and the amount of their income. Most consumers wanted the lean beef to be light or medium red, and a high percentage wanted marbling. About 35 percent preferred yellowish to white fat, indicating that the prejudice against yellow fat is perhaps not so strong as has been thought by the meat trade.

The survey in Decatur showed definitely that most women purchasing beef knew little about either the grades or brands of beef, whether they purchased graded beef, and whether they purchased steer, heifer, or cow. For the most part, neither consumers nor retailers distinguished between the numerous packers' brands nor understood their significance.

It is concluded that both consumers and retailers would profit in intelligent buying by educational work to acquaint them with what constitutes quality in beef and with the different Government grades and packer brands and what they stand for.

Influence of rate of freezing and temperature of storage on quality of frozen meat, C. W. DU BOIS, D. K. TRESSLER, and F. FENTON. (N. Y. State Expt. Sta. coop. Cornell Univ.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 167-179, figs. 13).—Paired, rolled rib roasts of beef weighing approximately 3 lb. from right and left sides of the same aged carcass were wrapped in cellophane, inserted in a stockinette, and each pair frozen by one of the following methods: (1) In still air at 0°, -10°, and -25° F.; (2) in an air blast at 0°, -10°, and -25°; (3) by brine immersion at -25°, the wrapped roasts being first slipped into a thin latex bag and then evacuated; (4) in brine spray at -25°; (5) in a multiplate froster (Birdseye) chilled to -25°; and (6) in a farm freezer with freezing compartment at -10° and equipped with a small 4-in. fan in the cover. Curves, indicating the rate of drop in temperature in the center of the roasts as determined by a potentiometer connected with a thermocouple placed in the center of each roast before wrapping, showed that the use of the fan cut in half the time required for freezing, and that even that time was halved in brine-immersion freezing. Microscopic examination of paraffin sections of the meats showed considerable break-down of tissues in meat frozen in still air at 0°, whereas the quick-frozen meats resembled fresh meat. Whole 3-lb. roasts thawed at 52° showed slight leakage—only about 1 percent of the weight of the roasts. Leakage was greater, however, when 100-gm. pieces were thawed at 60° for 24 hr., the losses averaging about 3.5 percent for the rapidly frozen meats (in brine and in the multiplate froster) up to nearly 8 percent for roasts frozen slowly in still air. These results, as well as palatability tests on the cooked roasts, indicated that the more rapidly the meat was frozen the better its all-round quality, although even the slowest frozen roast was tender, juicy, and of good flavor.

Frozen pork, lamb, and veal chops and beefsteaks wrapped in moisture- and vapor-proof packages were stored at various temperatures. Samples held at 0° or lower were still in good condition at the end of 14 mo., but at storage temperatures of 10° and 15° the fat of the samples became somewhat rancid in from 3 to 5 mo. Consequently, storage temperatures greater than 0° should not be recommended for meat.

Preserving meat and poultry by quick freezing at home, C. W. DuBois (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 13-14, figs. 2).—This general discussion indicates the desirability of using tender young animals for frozen meat products and points to the importance of proper packaging in moisture-vapor-proof wrappers and of maintaining proper storage at temperatures of 0° F. in order to prevent the development of rancidity.

A study of the yellow discoloration of canned oysters, E. W. HARVEY and C. F. SHOCKÉY. (Oreg. State Col.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 181-184).—Canned oysters showing yellow discoloration after several months' storage were obtained from four different areas, including samples from the eastern coast and from three different areas on the west coast. The discoloration appeared in tissue surrounding the liver, the thickness of the discolored area varying from 1 to 8 mm. in different oysters. It was observed that discoloration

appeared in a much shorter time in samples held at 82.2° C. than in those held at room temperature, while samples held at -17.8° for a period of 1 yr. were practically free of discoloration. Discolored tissue removed with great care to exclude any portion of liver was extracted with carbon disulfide. The extract was a bright yellow color. Livers removed from the oysters were similarly extracted, giving an extract very dark in color, with a greenish cast, and appearing deep red by transmitted light.

Tests excluded bile salts as the cause of the color in the tissue extract. This extract, subjected to chromatographic analysis, using a packed column of calcium carbonate, gave a lower rose-colored band about 5 mm. deep, three upper, narrower yellow bands, and between the second and third band a faint tinge of green. The chromatograph with the gross liver extract showed these identical color bands, as well as a broad brown and a broad green band. Spectrographic analysis of the carbon disulfide eluate of the portion of the column containing the rose band gave absorption bands at 521 and 485 $m\mu$, these being characteristic of β -carotene. The third absorption band was at 433 $m\mu$. The yellow layers of the chromatograph were due to the three xanthophylls. The evidence obtained is considered as ample proof that the yellow discoloration of the tissues surrounding the liver of canned oysters was due to carotene.

Determination of the quality of vegetables, F. A. LEE. (N. Y. State Expt. Sta.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 33-38).—This article reviews briefly work that has been done in developing physical and chemical tests for routine determinations of the maturity of fresh, canned, and frozen vegetables.

Mineral losses in washing fresh vegetables preparatory to cooking [trans. title], C. DIENST (*München. Med. Wchnschr.*, 87 (1940), No. 43, pp. 1180-1182).—A number of vegetables, including lettuce, rutabagas, carrots, kohlrabi, potatoes, several kinds of cabbage, and brussels sprouts, were soaked in water for periods of 1 and 6 hr.; the root vegetables were peeled and soaked whole or after being cut and the cabbage either as whole or cut leaves. The wash water was analyzed in each case for the amount of the various minerals lost from the vegetables during soaking. The values obtained were then calculated as percentages of the minerals present in the raw vegetables. Figures for the latter were obtained in part from original analyses of the raw samples before soaking, but were taken for the most part from tabulated averages of R. Berg. Calculated on this basis, losses from 1.44 to 32.2 percent are reported for potassium, from 0 to 15.1 for sodium, from 0 to 98.2 for calcium, from 0 to 95.5 for chlorine, 0 (or undetermined) for phosphorus and sulfur, and from 0 to 6.29 percent for nitrogen. Losses were slight in the case of the uncut vegetables.

Comparison of nutritive value of refined coconut oil and butterfat, R. S. HARRIS and L. M. MOSHER (*Food Res.*, 5 (1940), No. 2, pp. 177-184, fig. 1).—Young healthy adult rats were fed diets in which refined coconut oil or butterfat, in two series of experiments, furnished fat at an abnormally high level (25 percent), the rest of the diet being made up of extracted skim milk powder (72 percent) and extracted brewers' yeast (3 percent) supplemented with iron and vitamins A and D. Animals on the experimental diets were guillotined at intervals of 15, 30, 60, and 90 days for histological examination and analysis of the body tissues. The results were compared with those for a control group on a standard stock ration.

Rats on the butterfat and coconut oil diets made comparable weight gains during the first 30 days, but by the end of 90 days the respective average total gains were 32 and 50 gm. The greater gain on the coconut oil diet was not due to greater food consumption, since the group receiving butterfat had consumed slightly larger amounts of the diet; nor did the greater weight gain represent increased accumulation of adipose tissue, since body and liver tissues of the two groups

contained essentially the same amount of fat (alcohol-ether extract) and true lipide (petroleum ether extract of the alcohol-ether extract). The animals on both diets developed a slight equally intense fatty infiltration of the body and liver tissues, as evidenced by histological examination and confirmed by chemical analyses. At the end of 90 days, for example, the tissues of these two groups and the control group averaged, respectively, 39.3, 38.8, and 29.6 percent of fat (dry basis) and 28.2, 27.4, and 23.2 percent of true lipides, while the liver tissues averaged 24.6, 26.4, and 23.0 percent of fat and 19.3, 20.4, and 17.0 percent of true lipides. Histological examination of various body tissues gave no evidence of pathological tissue changes in any animal in any group. "These results indicate that butterfat and coconut oil, even when fed at rather high levels in a complete diet, are equally harmless to rats and presumably to man."

Study [of] corn sweeteners in frozen desserts, A. C. DAHLBERG (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, pp. 1, 12).—It was observed that dextrose in ice cream where it was used in 15-percent concentration seemed sweeter, as compared with a like concentration of sucrose, than it did in comparative tests when used in chocolate milk at 5-percent concentration. An investigation of other sugars (lactose, maltose, levulose, and corn sirups) showed that their relative sweetness with respect to sucrose increased as the concentration increased. These results indicate that the sweetening value of dextrose and corn sirup in foods will vary with the concentration in which they are used, as well as with the characteristics of the food to be sweetened.

Uptake of zinc by honey during extraction from the comb, H. A. SCHUETTE and P. L. ZIMMERMAN. (Univ. Wis.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 149-152).—Zinc was determined by the method of Caughey et al. (E. S. R., 80, p. 296) in 43 honeys, representing a wide variety of floral sources and all the commercial color grades. The samples were assembled from numerous places so that products of 14 States, the Hawaiian Islands, and the West Indies were represented. The 13 samples of comb honey, ranging from 0.32 to 2.01 mg. per kilogram, averaged 0.85 mg. That honey takes up zinc from the galvanized iron of the extractor in the process of extraction was indicated by the higher zinc values for the extracted honeys. The 13 samples of extracted honey packed in glass averaged 2.5 mg. per kilogram; 12 of these ranged from 0.47 to 5.12 gm., and 1 sample contained as much as 17.20 mg. per kilogram. The 17 samples of extracted honey packed in tin containers averaged 3.5 mg. per kilogram; of these 16 ranged from 0.67 to 5.40 mg., and 1 contained as much as 17.70 mg. per kilogram.

Maraschino cherries improved in flavor (*Farm Res. [New York State Sta.]*, 7 (1941), No. 4, p. 1).—A sirup made from Montmorency and English Morello cherries was found satisfactory for sweetening colored, hardened Napoleon cherries in the preparation of maraschino cherries. The use of this sirup eliminates the peculiar artificial flavor associated with the maraschino type cherry.

The abc of canned fruit and vegetable labeling (*U. S. Dept. Agr., Misc. Pub.* 460 (1941), pp. 8, figs. 7).—The grades established by the U. S. Department of Agriculture are described briefly with a list of the grades developed for 40 commodities.

Food consumption of 538 farm and 299 village families in Vermont, V. BRITTON (*Vermont Sta. Bul.* 474 (1941), pp. 46).—This report, continuing the series of analyses of the Vermont data from the consumer purchases study (E. S. R., 85, p. 863), takes up the food consumption data of 538 farm and 299 village families of Vermont. The results of the study are summarized as follows:

"Augmented income brought increases in the value of food consumed per meal per person and per food-cost unit for both farm and village families, value

per person being higher for the farm families and value per food-cost unit being higher for village families at comparable income levels, family type being held constant. Consumption of foods by farm families was more generous in relation to their needs for milk and potatoes than was that of village families at the same income levels; however, consumption of meats, sugar, tomatoes and citrus fruits, leafy, green, and yellow vegetables, and other fruits and vegetables was more generous in relation to the needs of village families than of farm families at comparable levels. Although quantities eaten in relation to needs tended to increase with growth in income, even farm and village families with incomes up to \$1,500 did not use enough fruits and vegetables which supply large amounts of the vitamins and minerals needed by the body.

"Growth in size of the family brought decreases in the value of food consumed per meal per person and per food-cost unit for both farm and village families, value per person being higher for the farm families and value per food-cost unit being higher for village families of comparable types of composition, incomes being held constant. Farm families of each type tended to use more eggs, milk, and potatoes in relation to their needs and village families used more meat, sugar, and flour in relation to needs, considering comparable family types with incomes of \$1,000 to \$1,499. Both farm and village type I and IV families, including mostly adults, ate freely of carbohydrates and fats, about an adequate supply of protein, and far too little fruits and vegetables. Types II and III, including one or two children per family, used generous supplies of carbohydrates, too little protein, and much too little fruits and vegetables. Inadequacy in consumption of fruits and vegetables seems to be common with all family types; inadequacy in proteins occurs when there are youngsters in the family; and generosity in the use of carbohydrates is common.

"Limited incomes and large family membership in relation to the income are two important causes of inadequate diets of these families. A more adequate knowledge of the principles of nutrition and of the methods of economical food buying, as well as a greater use of home gardens, would all lead to dietary improvements without depending on increases in income, considerable gains being necessary when family membership is large."

A study on the trend of weight in white school children from 1933 to 1936: Material based on the examinations of pupils of the elementary schools in Hagerstown, Maryland, G. WOLFF (*Child Develpmt.*, 11 (1940), No. 3, pp. 159-180, fig. 1).—In an extension of the observations of Palmer on the growth of white elementary school children of Hagerstown (E. S. R., 73, p. 130), height and weight data were obtained for the years 1933-36, inclusive, for children 6-13, 6-14, 6-15, and 6-16 yr. of age, respectively. This report covers the analysis of the weight data by single age groups at successive calendar years, with tabulations for each age class of the number of children examined, range of the weight distribution, and the mean weight in pounds with its standard error, standard deviation, and coefficient of variation.

Curves constructed from the mean weights each year of boys and girls separately in the successive age groups showed no consistent or statistically significant change in body weight at a given age from 6 yr. through 11 yr. during the single calendar years from 1933 to 1936 and no significant variation from the adjusted values of the combined years of 1921-27, as reported by Palmer. From 12 yr. of age and up, both boys and girls showed a statistically significant increase of mean body weight. In the 12- to 13-yr. group the maximum annual increase amounted to 4.6 lb. for the boys and 5.2 lb. for the girls; in the 13- to 14-yr. group the increases were 8.1 and 6.1 lb., respectively; and in the 14- to 15-yr. group the maximum increase for the boys amounted to 16.1 lb., while the increases for the girls were insignificant. The mean body weights for the same

age groups (12, 13, and 14 yr.) were distinctly below the averages for the previous decade in 1933 and 1934 and somewhat above in 1935 and 1936. Variability constants were distinctly higher for the girls than the boys in almost all age groups and this variability was greater than in the earlier period.

"The considerable increase in weight of the older children in the years from 1935 on are in fairly good agreement with the tendency to a general increase of growth observed all over the world and especially demonstrated for German school children after the last World War. The actual reasons for such a tendency are not yet clear. This trend may demonstrate the influence of various 'growing' years or, more strictly speaking, the influence of varying natural and social environmental factors such as climate, hours of sunshine and rainfall, or the socioeconomic characteristics of the years under observation. It may also be reasonable to suppose that such a world-wide sociobiological transformation as the general birth decrease in our time is indirectly involved in the growth phenomenon."

Studies on basal metabolism in Bombay.—II, Basal metabolism of boys, S. P. NIYOGI, V. N. PATWARDHAN, P. L. POWAR, and M. V. SIRSAT (*Indian Jour. Med. Res.*, 28 (1940), No. 2, pp. 345-351, fig. 1).—The basal metabolism of 35 boys between the ages of 11 and 16 yr. was determined, using the Sanborn metabolism test and the technic described in the first study of this series (*E. S. R.*, 82, p. 418). Heat production, as averaged for the various age groups, ranged from 36.0 to 40.0 calories per square meter per hour. "The average B. M. R. [basal metabolic rate] was lower than the Mayo Clinic and DuBois standards by 16.8 percent and 15.9 percent, respectively, and 5.0 percent lower than the Harris and Benedict standards."

Studies in calcium and phosphorus metabolism, III, IV (*Indian Jour. Med. Res.*, 28 (1940), No. 2, pp. 353-369).—In continuation of the series⁸ two papers are presented.

III. *The calcium content of soft tissues of albino rats in rickets and hypervitaminosis D*, V. N. Patwardhan and R. G. Chitre (pp. 353-360).—Since earlier work indicated that diet influenced the calcium and phosphorus content of the soft tissues of normal albino rats, the study was continued to determine the calcium and phosphorus content of soft tissues of animals with diseases characterized by disturbances of calcium metabolism. Analyses for calcium content were made of tissues from animals maintained on a stock diet; on a rachitogenic diet, producing rickets in from 4 to 5 weeks as indicated by bone analysis; and on the rachitogenic diet supplemented with 60 International Units of vitamin D daily. Additional animals on stock diets containing 390 and 789 mg. percent of calcium and 315 and 625 mg. percent of phosphorus, respectively, were given daily injections of 4,500 and 7,200 I. U. of vitamin D, respectively, per rat per day until signs of hypervitaminosis appeared. The results, analyzed for statistical significance, indicated that there was a significant reduction in calcium content of the brain and liver of rachitic rats and an increase in calcium content of the lung, while other tissues examined remained unchanged. "Excessive dosage with vitamin D led to an increase in the Ca content of muscle, brain, spleen, testes, liver, and heart; the Ca content of lungs and kidney, however, remained unchanged. Histological examination of tissues of these rats did not reveal signs of calcification except in the kidneys of a few rats. Hence it is suggested that the calcification of soft tissues probably does not depend only on the increased Ca content of blood and tissues, but some other factor or factors might also be necessary for the deposition of this element."

⁸ *Indian Jour. Med. Res.*, 25 (1938), No. 3, pp. 633-642; 26 (1938), No. 2, pp. 447-458, fig. 1.

IV. *The absorption of calcium from the intestine*, R. G. CHITRE and V. N. PATWARDHAN (pp. 361-369).—The absorption of calcium was studied by introducing calcium chloride or calcium lactate solution into the duodenum of anesthetized fasting dogs and determining at intervals, over 3-4 hr., the calcium and phosphorus level in the portal blood serum and the mesenteric lymph. Samples of blood and lymph obtained before the injection of the calcium salts were analyzed as controls. In preliminary experiments, in which dogs were kept anesthetized for 3-4 hr. without injection of calcium, there was a small but definite fall in the serum calcium.

Following the injection of the calcium lactate or chloride, a rise in the calcium content of the portal blood serum and mesenteric lymph was observed. This increase in calcium in both fluids is interpreted to indicate that both the portal venous system and the mesenteric lymphatics participated in the absorption of calcium from the intestines. "No relationship was observed between the rise in Ca in the portal blood serum and (1) the dose or the concentration of calcium salt, (2) the pH of the solution introduced, or (3) the preabsorption level of Ca in blood serum."

Distribution of ingested phosphorus in bone and teeth of a dog, shown by radioactive isotope, M. L. MANLY, H. C. HODGE, and S. N. VAN VOORHIS (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 70-72).—"The uptake of radioactive phosphorus was greater in spongy than in dense diaphyseal bone when salts of the element were administered orally to a dog. In dentine the amounts of radioactive phosphorus were constant for the various teeth and of the same order as that present in dense diaphyseal bone. No more than traces of P* [=radioactive phosphorus] were found in the enamel."

Magnesium metabolism in man, K. P. BASU and M. C. MALAKAR (*Indian Jour. Med. Res.*, 28 (1940), No. 2, pp. 333-343).—Twenty carefully controlled metabolism experiments were conducted on three healthy adult men accustomed to live on the cereal-rich diets of poor village families in India. The basal diets used were typical Indian cereal diets of rice or wheat (550-600 gm. daily), with small amounts of dry legumes, fresh vegetables, fish, butterfat or mustard oil, and usually sugar. After from 6 to 9 days on a particular diet, the effect of supplementing it daily with 275 cc. of cow's milk was observed for 6 days. Three-day adjustment periods were allowed for each regime before collection of samples was begun. Magnesium in feces, urine, and foodstuffs was determined by precipitation with 8-hydroxyquinoline.

The maintenance requirement of magnesium calculated from those experiments in which the subjects were nearly in balance was 0.429 gm. per adult per day. The addition of the milk, which supplied about 30 mg. of magnesium, did not improve the retention of magnesium and with continued intake often caused a slightly greater elimination. With the diets used, the subjects were either just in equilibrium or in negative magnesium balance, indicating that the typical Indian diet does not contain a sufficient margin of this element and should be supplemented with sufficient amounts of green vegetables and legumes.

Effects of acute dietary zinc deficiency in the rat, H. G. DAY and E. V. MCCOLLUM (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 282-284).—This is a brief preliminary report of a study showing that young rats restricted to a diet furnishing not more than 2-4 μ g of Zn per rat per day quickly developed extreme degrees of deficiency.

Rate of absorption of amino acids from the small intestine in man, L. C. MCGEE and E. S. EMERY, JR. (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 475-477, figs. 2).—"By means of intestinal intubation in man the absorption rate of hydrolyzed and unhydrolyzed protein from the jejunum has been esti-

mated. Most of the nitrogen of a 4 to 5 percent solution of casein and gelatin is absorbed 40 to 50 min. after its introduction directly into the small intestine. The nitrogen of an amino acid mixture (hydrolyzed casein) of similar concentration is fairly completely absorbed 15 to 25 min. after its administration in the same manner."

The metabolism of citric acid by infants, A. H. SMITH, D. J. BARNES, C. E. MEYER, and M. KAUCHER (*Jour. Nutr.*, 20 (1940), No. 3, pp. 255-262).—Eight infants from 4 to 12 mo. of age, with varying degrees of mild clinical rickets but without other abnormalities, served as subjects in a series of citric acid metabolism tests. This paper reports a single 3-day period during which free citric acid in amounts of 365 mg. per kilogram body weight per day was administered in divided doses, and one or two basal periods for each subject without added citric acid. The data show that "the oral administration of free citric acid results in a marked decrease in the proportion of the ingested citric acid and food citrate appearing in the urine, as compared with that of the control period in which the basal diet is the only source of citric acid. Ordinarily, the feces contain a small amount of citric acid. The citric acid of intestinal contents is uninfluenced by the addition of free citric acid."

Choline metabolism, II, III (*Jour. Biol. Chem.*, 132 (1940), No. 2, pp. 627-637, 639-644).—In continuation of the investigation noted previously (E. S. R., 83, p. 845) two papers are presented.

II. *The interrelationship of choline, cystine, and methionine in the occurrence and prevention of hemorrhagic degeneration in young rats*, W. H. Griffith and N. J. Wade.—The addition of from 0.3 to 0.5 percent of cystine to the low-choline basal diet used in the first study of the series increased the incidence of renal lesions, the deposition of liver fat, and the weights of spleen and kidneys, and decreased the weight of the thymus in young rats. In 19 out of 20 animals the addition of 0.25 mg. of choline chloride per gram of food to the diet containing 0.3 percent of cystine prevented the development of renal lesions, but only slightly diminished the fatty liver effect. With 0.5 mg. of cystine three times as much choline was required for equal protection. The effects of hemorrhagic degeneration were widespread. Parallel changes in the fresh and dried weights of the thymus, spleen, and kidney indicated that the tissue effects were not due merely to variations in water content. Changes in kidney weight were found to be a more accurate measure of the extent of choline deficiency than deposition of liver fat.

Methionine had a cholinelike protective action, but 10 mg. of *dl*-methionine was required to give the same effect as 1 mg. of choline chloride. Various mixtures of fibrin, casein, and dried egg albumin were tested for the effect of variations in the ratio of protective methionine to toxic cystine. Although the results did suggest that proteins high in methionine and low in cystine were protective, this ratio was not the only factor determining the incidence of hemorrhagic degeneration in these rats, for when the same protein mixture was fed at 5-, 10-, and 15-percent levels, renal lesions were absent on the 5-percent level, moderate on the 10-percent, and very severe on the 15-percent level. A similar increase in toxicity with higher levels of protein was also shown with the single protein casein.

III. *The effect of cystine, fat, and cholesterol on hemorrhagic degeneration in young rats*, W. H. Griffith.—In the present study hemorrhagic degeneration was produced in 5 of 20 young male rats on a diet containing no fat other than 0.1 percent of the fortified fish-liver oil Natola, even although the dietary protein was protective in the sense of high-methionine and low-cystine content. The addition of 1 percent corn oil fatty acids caused an increase to 47 percent in the kidney damage, and a further supplement of 8 percent of lard an additional in-

crease in kidney damage to 75 percent. The addition of 0.5 percent of cystine resulted in renal injury to 75 percent of the test animals. No injury occurred when the casein was increased to 45 percent even in the presence of 0.5 percent of cystine or when 0.3 percent of choline was added. The livers of all of the rats on the low-choline diets were fatty.

When 1 percent of the corn oil fatty acids and 6 percent of whole dried yeast replaced the 5 percent of ether-extracted yeast, the occurrence of hemorrhagic degeneration was only slightly affected, but when the lard supplement was increased to 8 percent the renal damage was as severe as that produced with 35 percent of lard. The addition of 0.3 percent of cystine also increased the severity of the renal damage, but the increased toxicity due to lard and cystine together did not appear to be additive. One percent of cholesterol alone or with lard increased the damaging effect of deficiency of choline, and the renal injury in this case was additive. It is suggested that the more marked effect of the cholesterol and lard together may have been due to increased absorption of cholesterol on the diet containing added fat. Cholesterol also increased the signs of choline deficiency in rats on a high-fat ration.

Choline metabolism.—IV, The relation of the age, weight, and sex of young rats to the occurrence of hemorrhagic degeneration on a low choline diet, W. H. GRIFFITH (*Jour. Nutr.*, 19 (1940), No. 5, pp. 437-448, fig. 1).—In continuation of the series noted above, observations are reported leading to the conclusion that young male rats 20 days of age are the most satisfactory animals for a demonstration of the result of choline deficiency and of the protective effect of choline and cholinelike substances, and that more consistent results can be obtained by using a 7-day than by a 10-day experimental period.

Choline, creatine, and the "labile methyl" supply, W. H. GRIFFITH and D. J. MULFORD (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 657, 658).—Data are presented to show that renal hemorrhages and fatty livers of young rats on a diet low in choline are not prevented by supplements of creatine, although the occurrence and severity of the renal lesions are decreased. Supplements of choline chloride or of creatine plus choline prevented the renal lesions; liver fat was not significantly decreased unless both creatine and choline were fed. In explanation of these results, it is suggested that an adequate supply of compounds containing labile methyl groups is needed by young rats, and that occurrence of hemorrhagic degeneration is evidence of the deficiency of choline and of a labile methyl supply. Choline, methionine, and betaine contribute such labile methyl groups, whereas creatine does not. However, dietary creatine does spare the labile methyl supply and makes available for choline formation those methyl groups which would otherwise be used in the synthesis of required creatine.

Nature and properties of the known vitamins, C. A. ELVEHJEM. (Univ. Wis.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 89-96).—A review.

Vitamin deficiencies in diarrheal states, W. B. BEAN and T. D. SPIES (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 13, pp. 1078-1081).—This paper, based on the authors' observations in an area of endemic pellagra, beriberi, and riboflavin deficiency, deals with the role of chronic diarrhea in the production of these and other vitamin deficiency syndromes. The mechanisms by which diarrhea may lead to deficiency states are summarized as increased loss and decreased absorption of ingested vitamins, impairment of possible vitamin synthesis in the intestines, decreased phosphorylation of vitamins, and increased demands resulting from various pathological conditions. Attention is also called to the role of some of the vitamin B complex factors in normal intestinal function.

Among 100 cases of deficiency disease developing as a complication of chronic diarrhea, 36 were pellagra (nicotinic acid deficiency), 13 summer diarrhea in infants and children, 10 intestinal obstruction of various types, 8 stricture, 3 bacillary dysentery, 3 nursing infants of mothers with diarrhea (pellagra), 2 each sprue, ulcerative colitis, intestinal tuberculosis, gastric neurosis, and thyrotoxicosis, 1 each gastrocolic fistula, post-operative adhesions, and food poisoning, and 14 undiagnosed. "In deficiency diseases which occur as sequels of a chronic diarrhea, parenteral injections of crystalline vitamins are essential in proper treatment but do not take the place of a high protein, high caloric diet. Nicotinic acid amide (from 500 to 1,000 mg. daily), thiamin hydrochloride (from 10 to 50 mg. daily), and riboflavin (from 2 to 10 mg. daily) will relieve specific deficiencies in most cases."

Riboflavin, vitamin C, and flavor of dairy products, P. F. SHARP and D. B. HAND. (Cornell Univ.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 139-144).—In this summary it is pointed out that dissolved oxygen in milk is responsible for certain off-flavors and that there is, therefore, a close interrelationship between these "oxidized" flavors and oxidizable-reducible substances in milk, particularly vitamin C and riboflavin. Consideration is given to the ascorbic acid content and factors affecting its destruction in milk, the role of riboflavin in oxidation-reduction of ascorbic acid; factors affecting riboflavin content of milk; the riboflavin content of skim milk, whey, and buttermilk, particularly as affected by adsorption of the vitamin on casein and by the presence of a flavoprotein on the fat-globule surface from which the flavin can be liberated by heat; the riboflavin in evaporated and dried milks and cheese; and the effect of heat and light on riboflavin.

Effect of processing on the vitamin A (carotene) content of foods, C. R. FELLERS. (Mass. Expt. Sta.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 97-107).—This review summarizes the findings of recent studies bearing on the relationship of color, maturity at harvest, and ethylene ripening and sulfuring on the vitamin A content of fresh foods; and on the effect of storage, freezing, heating, drying, and other procedures on the vitamin A content of foods subjected to these processes.

Clinical studies of vitamin A deficiency: Biophotometer and adaptometer (Hecht) studies on normal adults and on persons in whom an attempt was made to produce vitamin A deficiency, B. L. ISAACS, F. T. JUNG, and A. C. IVY (*Arch. Ophthalmol.*, 24 (1940), No. 4, pp. 698-721, figs. 9).—In this extension of an earlier investigation (E. S. R., 80, p. 709), the results in general were negative or unreliable. Concerning the biophotometer tests, while straight graphing of values suggested that the prolonged administration of liquid petrolatum reduced the subjects' ability to become dark adapted and the ingestion of large doses of vitamin A tended to improve dark adaptation, the majority of the fluctuations did not prove to be mathematically significant. In the work with the more satisfactory adaptometer (Hecht) and more rigid supervision of the diet the results were also inconclusive. Three subjects who lived on an A-deficient diet for 43, 49, and 49 days, respectively, failed to show more than a suggestion that their vitamin A stores were being depleted. Measurements of vision, size and shape of the physiologic blind spot, and of visual fields failed to indicate consistent changes which could be attributed to A deficiency or therapy. Doses as high as 300,000 units of vitamin A daily for as long as 4 mo. failed in some instances to improve the dark threshold in 10 patients suspected of having vitamin A deficiency.

In discussing the prevalent opinion of a probable vitamin A deficiency among the general population, the authors state "the possibilities which occur to us are, first, that the average American diet may be deficient in available vitamin

A or its precursors; second, that the standard of vitamin A intake on which subjects are judged to be deficient is questionable, and third, that the procedures being used for measurement are recording something other than vitamin A deficiency. We incline toward a combination of the latter two possibilities. A large subjective factor is involved in the determinations obtained in all types of visual tests. It is our opinion that the subjective factors should be recognized and an attempt be made to control them when measurements of dark adaptation levels are made; also, that significance should not be attached to minor fluctuations in dark adaptation in terms of vitamin A deficiency unless statistical methods are used to test the reliability and validity of differences."

Relative overgrowth of the central nervous system in vitamin A deficiency in young rats, S. B. WOLBACH and O. A. BESSEY (*Science*, 91 (1940), No. 2373, pp. 599-600).—Failure to produce neurological lesions in vitamin A-deficient rats after normal growth had occurred up to an age of from 10 to 12 weeks, although ataxia and paralysis may be produced regularly in rats if the deficiency has been established at an early age, is explained as the result of a relative overgrowth of the central nervous system during the early weeks of life, resulting in mechanical damage and degeneration of the nerve fibers. An investigation of the phenomenon has shown that the unequal growth of bone and nerves occurs between the fortieth and sixtieth days and is most strikingly exhibited in the lumbar and sacral regions, although it is manifest to some degree throughout the entire length of the spinal cord. The gross manifestations of the resulting injury are described.

Clinical studies of experimental human vitamin B complex deficiency, K. O. ELSOM, F. H. LEWY, and G. W. HEUBLEIN (*Amer. Jour. Med. Sci.*, 200 (1940), No. 6, pp. 757-764, figs. 2).—A healthy woman subject about 60 yr. of age lived for a period of 9 weeks on a constant weighed diet considered to be adequate in all respects except for the B vitamins, of which thiamin alone was present in approximately one-third the individual's minimum requirement as calculated by the Cowgill formula. At the end of this period, thiamin chloride was administered in doses of 20-120 mg. daily for 18 days. Then followed a period of 20 days during which 6 mg. of riboflavin was administered in addition to the thiamin, and a final period of 18 days during which 42 mg. daily of brewers' yeast was given in place of the thiamin and riboflavin.

Signs and symptoms developing during the period included an increase in the pulse rate by an average of 17 beats per minute over the control period associated with cardiovascular symptoms but no change in resting blood pressure, orthodiagram, or electrocardiogram; mild neurological symptoms with diminution in electrical irritability of the peripheral nerves; and nervousness and irritability developing during the fifth week and gradually increasing in severity, with loss of memory and inability to concentrate evident in the latter part of the deficiency period. All of these responded to thiamin treatment. Gastrointestinal symptoms associated with roentgenographic evidence of delayed motility of the small intestines were not relieved until yeast was given, and a mild macrocytic anemia was relieved only after 4 weeks on a general diet supplemented with brewers' yeast.

Other observations noted were fatigability, which became excessive toward the end of the thiamin-deficient period; edema of the upper and lower extremities, in spite of normal serum protein; paleness, flabbiness, and loss of elasticity of the skin; and gradual loss of weight. Administration of thiamin brought about temporary improvement in all of these symptoms, but after 10 days the symptoms returned and were not affected by riboflavin but were cured by yeast.

The synthesis of flavin-adenine dinucleotide from riboflavin by human blood cells in vitro and in vivo, J. R. KLEIN and H. I. KOHN (*Jour. Biol. Chem.*, 136 (1940), No. 1, pp. 177-189, figs. 2).—The synthesis of flavin-adenine dinucleotide from riboflavin by human blood cells in vitro and in vivo is demonstrated. A method of determining riboflavin in urine with the use of a Coleman photoelectric spectrophotometer is described, and the fate of ingested urine is followed.

After the ingestion of approximately 200 mg. of riboflavin, approximately 25 percent was recovered in the urine as riboflavin and 0.14 percent in the cells as flavin-adenine dinucleotide, this representing an increase of approximately 30 percent. These results are contrasted with those obtained in the synthesis of factor V (pyridine nucleotides) from nicotinic acid by human blood cells (E. S. R., 88, p. 858), which is approximately 100 times as great.

Observations on induced thiamine (vitamin B₁) deficiency in man, R. D. WILLIAMS, H. L. MASON, R. M. WILDER, and B. F. SMITH (*Arch. Int. Med.*, 66 (1940), No. 4, pp. 785-799, figs. 7).—Previous observations of the effect of prolonged thiamin deficiency (E. S. R., 82, p. 852) have been confirmed by the results obtained with six additional women subjects in the same institution. Of these, four were maintained as long as possible on a diet furnishing less than 0.15 mg. of thiamin daily but otherwise adequate nutritionally. The other two, after 11 days on this diet, were given thiamin hydrochloride orally (without their knowledge) in gradually increasing daily doses up to 2 mg.

The four subjects receiving no thiamin responded as did those of the earlier study but with more rapid development of symptoms of intolerance for food, necessitating the termination of the restriction of thiamin after 88 days as compared with 147 days in the earlier study. It is suggested that as the earlier study was conducted in the spring and summer and the present one in the winter, a greater total metabolism provoked by low temperature or changeableness of the weather may have led to a relatively greater thiamin requirement. The effect of physical activity on thiamin requirement was also shown in the earlier development of serious symptoms in the more active than in the less active subjects, the range in time before the appearance of clear evidence of deficiency being from 14 to 48 days. The two subjects receiving thiamin showed evidences of deficiency until their total intake reached 0.95 mg. daily. From then on they were free from symptoms, but showed a gradual increase in the feeling of well-being and in capacity to work with increased dosage. The return to an unsupplemented hospital diet calculated to furnish from 0.6 to 0.8 mg. of thiamin daily was followed by a let-down in spirits and a decreased ability to work.

A chemical test for vitamin B₆ in foods, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 28 (1940), No. 2, pp. 427-439).—A more detailed presentation is made of a method noted earlier (E. S. R., 85, p. 411). The vitamin B₆ content of 22 foodstuffs, including cereals and cereal products, legumes, vegetables, flesh foods, milk, and yeast, was determined. Dried brewers' yeast, averaging 52 μ g. per gram, was the richest source, with rice polishing and liver, containing 19 and 14 μ g. per gram, respectively, next in order. Of the cereals, white flour and highly milled rice contained but 3.3 μ g., while the unmilled cereals contained from 6.9 to 10.7 μ g. per gram. The dry legume seeds varied from 8.6 to 10.9 μ g., while values from 1.1 to 2.9 μ g. were obtained for the few fresh vegetables (beets, cabbage, carrots, and potatoes) analyzed.

Development and cure of "ring-tailed" condition in rats on vitamin B₆ deficient diets, L. W. McELROY and H. GOSS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 717-719, fig. 1).—In this preliminary note attention is called to ringlike lesions developing, after approximately 7 weeks,

in the tails of a small percentage of rats on a vitamin B₆-depletion diet. The lesions were characterized by slight constrictions encircling the tail at intervals and bounded at first by slightly swollen scaly areas. The condition did not develop beyond this point in the continued absence of vitamin B₆, but when the diet was supplemented with synthetic vitamin B₆ the condition was greatly aggravated for from 3 to 7 days, after which there was healing and rapid growth of the tail. Additional cases of a more severe type also occurred within from 2 to 5 days of supplementing the diet.

The antianemic and the antidermatitic action of yeast extracts and of Adermin [trans. title], H. J. WOLF and E. SEIDEL (*Klin. Wchnschr.*, 19 (1940), No. 43, pp. 1106-1109, figs. 6).—Evidence is presented that by the subcutaneous injection of yeast extracts experimental typhus anemia in rabbits can be cured or delayed in its appearance and skin abscesses at the site of injection of the typhus toxin are prevented and cured. Oral administration of the yeast extract even in doses three times the effective dose for subcutaneous administration is without effect. Nicotinic acid and lactoflavin administered subcutaneously or intravenously are without effect on the anemia or the skin lesions, but pure vitamin B₆ (Adermin or pyridoxine) is as effective as the yeast. The role of pyridoxine for the maintenance of a peripheral blood picture is thought to be established by these findings.

Effect of processing on the vitamin C content of foods, C. G. KING and D. K. TRESSLER. (N. Y. State Expt. Sta. et al.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 123-132, figs. 3).—This review summarizes recent studies (1936-40) on the effect of storage, dehydration, crushing and slicing, freezing, pasteurization, cooking, canning, and fermentation and pickling on the vitamin C content of foods.

Cobra venom and vitamin C [trans. title], I. I. NITZESCU and M. STAN-SUCIU (*Klin. Wchnschr.*, 19 (1940), No. 43, p. 1112).—Six guinea pigs were given a lethal dose of cobra venom (0.4 mg. of the dried venom per kilogram body weight) and immediately after death, which occurred in a few hours, their livers and adrenals and for each animal those of a control of the same sex and weight were analyzed for ascorbic acid. In each case the content of ascorbic acid was much higher in the organs of the normal than of the poisoned animal. Average values for the controls were liver 25.7 and adrenals 117.2 mg. per 100 gm. fresh material and for the experimental animals 10.9 and 51.4 mg. per 100 gm., respectively. These results are in agreement with those reported for microbial viruses such as diphtheria toxin and with observations of the lowering of the vitamin C content of the body during the course of infectious diseases.

Fat as a factor in the healing of rickets with vitamin D, A. KNUDSON and R. J. FLOODY (*Jour. Nutr.*, 20 (1940), No. 4, pp. 317-325, fig. 1).—The rachitogenic diet (6C), made up largely of purified materials and low in lipides, was shown to produce a uniform degree of rickets similar to that obtained with the Steenblock-Black 2965 diet. To study the effect of fat on the healing of rickets by vitamin D, 5, 10, and 20 percent of a hydrogenated fat was substituted for the sucrose of diet 6C in various experiments and 0.025 or 0.1 μ g. of the vitamin was fed separately or dissolved in propylene glycol and mixed with the diet, these amounts being consumed in from 6 to 7 days. The addition of 5 percent fat to either of the rachitogenic diets gave much better healing than with no fat in the diet. With the addition of from 10 to 20 percent of fat, the healing was less than with 5 percent of fat but greater than was obtained with no fat. To determine whether the beneficial effect of the fat was due to the formation of calcium soaps, rendered soluble by bile and thus readily absorbable, calcium in the form of calcium oleate or stearate was substituted for the CaCO₃ in diet 6C. When one-fourth of the CaCO₃ was

thus substituted, the fatty acids combined in the calcium soaps were equivalent to the fatty acids obtained from the hydrolysis of 5 percent of fat in the diet; when all of the CaCO_3 was replaced by the calcium soaps, the fatty acid components were equivalent to the amounts obtained from 20 percent of fat in the diet. In the former series the calcium soaps (stearate or oleate) gave no more healing than was obtained with the fat-free controls, which was in contrast to the greatly increased healing obtained with 5 percent of fat in the diet. In the latter series the healing was much greater than with 20 percent of fat in the diet. "In view of these apparently contradictory results it seems evident that the greater effectiveness of 5 percent of fat in the diet over 20 percent of fat in the diet cannot be explained on the basis of the formation of calcium soaps."

Prothrombin in the newborn infant: Relationship to the maternal dietary vitamin K intake, S. KOVE and H. SIEGEL (*Jour. Ped.*, 17 (1940), No. 4, pp. 448-457, figs. 2).—Prothrombin clotting times, determined on undiluted and on diluted (1:1) plasma by the method of Quick, and prothrombin concentration were determined for 76 normal infants from 1 to 8 days of age. These values and the frequency distribution graph of prothrombin concentration indicate that low prothrombin levels (below 75 percent) occurred in 52 of the infants, that wide individual variations occurred in each of the first 8 days but most commonly in the first 2 days, and that the average prothrombin level was lowest in the first 2 days, rising slowly thereafter but remaining below the normal adult value. A study of the dietary histories of 68 of the 76 mothers indicated that 40 of them had had an apparently adequate dietary vitamin K intake, and that only 4 could be considered as having had a diet markedly deficient in vitamin K. A study of these dietary histories in connection with the infant prothrombin concentrations failed, however, to reveal any correlation between them. These findings suggest that food sources, unlike vitamin K concentrates, do not necessarily insure adequate prothrombin levels in the newborn. Prophylactic administration of vitamin K concentrate to the mother before labor is, therefore, recommended.

TEXTILES AND CLOTHING

The microscope in textile analysis, W. O. HOLME and F. J. MUNOZ (*Rayon Textile Mo.*, 22 (1941), Nos. 1, pp. 77-79, figs. 5; 2, pp. 70-72, figs. 3).—The many uses of the microscope in the textile laboratory are noted, and the discussion is concerned with the accessories required; the minimum, optimum, and optional equipment; the preparation of specimens; the proper instrument technic; the measurement of diameter; the advantages of projection; and projecting arrangements.

Textile fiber atlas, X-XIII, W. VON BERGEN and W. KRAUSS (*Rayon Textile Mo.*, 21 (1940), No. 12, pp. 47-50, pls. 2; 22 (1941), Nos. 4, pp. 58-60, pl. 1; 5, pp. 51-55, pls. 2; 6, pp. 47-51, 52, pls. 2).—In continuance of this series (E. S. R., 85, p. 141), the following four papers are presented:

X. *Structural fibers*.—Sisal, manila, New Zealand flax, piassava, raffia, coir, and Spanish-moss are considered with respect to origin, color, general and microscopic appearance, and color of the ash. Photomicrographs are presented. The principal physical and microscopic characteristics for differentiation of sisal, manila, and New Zealand flax are tabulated, and cross-sectional and width measurements are recorded.

XI. *Mineral fibers*.—Asbestos and glass, the two mineral fibers of commercial textile importance, are discussed with respect to use and microscopic appearance (with photomicrographs). Fiber glass is made into two basically different types of textile fibers—continuous filament yarn and staple fiber.

XII. *Official U. S. standards for grades of wool top.*—Specifications for the 13 grades are given, together with photomicrographs and a tabulation of diameters of cross sections, fineness distribution, and minimum number of fibers required for the test. Methods of the tests are noted briefly. Comparative data from two sources on actual measurements of five grades are tabulated.

XIII. *Wool fiber damage.*—Microscopic appearance, illustrated by photomicrographs, and certain microchemical reactions are discussed with regard to their use in detecting fiber damage due to various causes which are classified as follows: (1) Physical, including deformities of the fibers and mechanical damage; (2) chemical, as caused by acid, alkali, chlorine, or oxidation; and (3) bacterial and insect. Results of examination of reprocessed and reworked wool are reported and discussed.

Studies on the basic characteristics of South African Merino wool.—**I, Breaking strength and tensile strength,** V. BOSMAN, E. A. WATERSTON, and C. M. VAN WYK. **II, Specific gravity,** C. M. VAN WYK and H. A. M. NEL. **III, Moisture adsorption,** C. M. VAN WYK (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 15 (1940), No. 1-2, pp. 313-324; pp. 325-332, fig. 1; pp. 333-339, fig. 1).—A summary is given of the interrelationship between strength, fiber fineness, specific gravity, and moisture adsorption in several wool samples collected in different parts of the Union of South Africa and under varied climatic conditions.

Qualitative identification and quantitative estimation of Nylon in the presence of silk, wool, and cotton, R. GERBER and K. LATHROP. (Okla. A. and M. Col.). (*Amer. Dyestuff Rptr.*, 29 (1940), No. 18, pp. 437-440, 457).—The results of qualitative tests, including the ignition test and various color and solubility tests, on Nylon fiber are presented, together with data from quantitative procedures applied in the estimation of Nylon in admixture with other fibers. These procedures were designed to fit in with and follow existing and accepted methods of analysis for natural fibers. In undyed fiber mixtures Nylon was most readily distinguished by dyeing with neocarmin, which imparted a pure green color to the Nylon. Chemically the solubility of Nylon in hot concentrated acetic acid served best to distinguish the fiber from cotton, while insolubility in calcium thiocyanate of sp. gr. 1.20-1.21 at 70° C., in boiling 5 percent KOH, in acetone, and in calcium thiocyanate of sp. gr. 1.36 at 70° served best to distinguish Nylon from silk, wool, cellulose acetate, and regenerated celluloses, respectively.

Quantitatively the use of calcium thiocyanate, sp. gr. 1.20-1.21 at 70°, was satisfactory to remove silk in the analysis of silk-Nylon mixtures. The use of boiling 5 percent KOH to remove wool in the analysis of wool-Nylon mixtures gave accurate results, and the use of boiling 80 percent acetic acid to dissolve the Nylon in cotton-Nylon mixtures also gave satisfactory results.

The identification of Nylon and Lanital textile fibers, M. A. MILLER, P. B. MACK, and E. N. CHAPMAN. (Pa. State Col.). (*Jour. Home Econ.*, 33 (1941), No. 4, pp. 255-263, pl. 1).—Microscopic and chemical tests frequently used in the identification of unknown textile fibers were applied, and observations as to the microscopic appearance of these two fibers are given, together with photomicrographs showing longitudinal and cross-sectional views at a magnification of 250 diameters. Reports are given as to the response of each fiber to the burning test and to the various reagents commonly in use in testing textile fibers. On the basis of the responses of Nylon and Lanital to these tests, a scheme of identification was devised to differentiate these fibers from each other and from the older fibers.

“If an unknown fiber melts without burning, gives a negative reaction with Millon’s reagent, fails to dissolve in sodium hydroxide solution, gives a medium green color in the neocarmin W dye test, dissolves in hot phenol solution but

does not dissolve in acetone, and gives a negative reaction with the cuprammonium and ammoniacal nickel oxide tests and a positive reaction with the zinc chloride test, the fiber is Nylon. If an unknown fiber burns like wool, gives a positive reaction with Milton's reagent, dissolves in sodium hydroxide solution, gives a biuret test, a negative lead nitrate test, and a negative sodium nitroprusside test, fails to dissolve in phenol or acetone, and gives a negative response to the cuprammonium, ammoniacal nickel oxide, and zinc chloride tests, it is Lanital."

The resin fiber "Vinyon," F. BONNET (*Amer. Dyestuff Rptr.*, 29 (1940), No. 21, pp. 547-548).—Vinyon, a copolymer of vinyl chloride and vinyl acetate, is briefly discussed with regard to its chemical and molecular structure, its chemical and physical properties, the steps involved in the conversion of the copolymer as a white powder into the final yarn, and the uses, actual and potential, of the yarn.

Terms relating to hand of fabrics (*Textile Res.*, 11 (1941), No. 3, p. 158).—A tabulation is given of terms suggested by committees of the American Association of Textile Chemists and Colorists and the American Society of Testing Materials for designation of the physical properties of fabrics relating to "hand." Thus, flexibility (ease of bending) would be associated with the terms pliable (high) to stiff (low) describing the range of the elements of "feel." Terms are similarly proposed for describing the properties of compressibility, extensibility, resilience, density, surface contour, surface friction, and thermal character.

Terms relating to the "hand" of fabrics (*Amer. Dyestuff Rptr.*, 29 (1940), No. 21, p. 560).—Essentially noted above.

Comparison of the breaking strength of fabrics as determined by the pendulum and incline plane testing machines, G. WHITE and E. C. PETERSEN. (U. S. D. A.). (*Rayon Textile Mo.*, 21 (1940), No. 12, pp. 69-70; 22 (1941), No. 1, pp. 70-71).—Calibration of the machines and test procedures are discussed, and results of tests are tabulated to show the physical properties (including breaking strengths by the two methods) of the two cotton, two linen, three silk, four wool, and five rayon fabrics tested. Statistical analysis of the breaking strength data is considered in some detail. The results of the experiment indicate that each fabric has its own peculiarities and that specific information concerning its breaking strength behavior cannot safely be deduced from that of other somewhat similar fabrics.

The data suggest that for an accuracy of 3 percent for 95 percent of the tests the number of samples varies with the type of fabric, rayon requiring the smallest number and wool next. For many fabrics, however, the five samples required in breaking strength determinations by the American Society for Testing Materials may not be sufficient for specification purposes. The manner in which samples are taken from a fabric is of importance except for viscose rayons, woolen flannel, and to a certain extent all other rayons. With all other fabrics the breaking strength samples should be scattered as much as possible throughout the piece of fabric. It is considered preferable to use the same type of machine for any set of breaking strength determinations and advisable for experimenters to report the type of machine used in obtaining data.

Comparison of some physical properties affecting the serviceability of certain silk, rayon, and silk and rayon mixed fabrics, H. FLETCHER, B. CARLSON, and H. K. PLATT. (*Kans. Expt. Sta.*). (*Rayon Textile Mo.*, 22 (1941), Nos. 7, pp. 77-78; 8, pp. 55-58).—Eight dress crepes, including four all-silk crepe fabrics and four all-rayon crepe fabrics, and eight slip fabrics, including one all-silk satin and one all-silk crepe, one rayon satin and two rayon crepes, and two silk and rayon satins and one silk and rayon crepe, were used in this study.

The mixed fabrics had silk warp and rayon filling. Data concerning the physical characteristics of the fabrics are presented. Breaking strength and elongation, abrasion, and shrinkage determinations were made on control samples of each of the fabrics. To test the serviceability of the materials, these tests were also made on dress fabric samples after 5 and 10 dry cleanings and on samples of the slip fabrics after 10 and 20 launderings. Crease resistance determinations were made on the dress crepes but not on the slip fabrics.

The mean values determined in these tests are tabulated. Statistical analyses of the data, presented and discussed, showed significant differences in the physical properties affecting the serviceability of the silk and rayon dress crepes and also of the silk, rayon, and silk and rayon mixed slip fabrics. "The silk fabrics in each group had much greater breaking strength than the rayon, and the silk slip fabrics had a greater breaking strength than the mixed fabrics. The silk and rayon slip fabrics exhibited much greater elongation than the mixed fabrics, and the silk had greater elongation than the rayon. The silk dress crepes had much greater elongation than the rayon. Successive dry cleanings increased shrinkage significantly, but there was no significant increase in shrinkage after the first laundering. In each group the rayon fabrics shrank more than the silk or mixed fabrics. The silk dress crepes were much more crease resistant than the rayon crepes."

Evolution of textile finishes, H. H. MOSHER (*Amer. Dyestuff Rptr.*, 29 (1940), No. 21, pp. 531-533, 570-571).—This review gives a picture of the chief functions of textile finishes and discusses in general terms recent advances in the development of softening agents, sizing agents, and special finishes for waterproofing, slipproofing, fiber lustering or conversely delustering, mothproofing, and imparting antiseptic properties.

Technical evaluation of textile finishing treatments, III-VI, L. J. WINN and E. R. SCHWARTZ (*Amer. Dyestuff Rptr.*, 29 (1940), Nos. 16, pp. P400-P404; 19, pp. P469-P476, figs. 7; 26, pp. P689-P696; 30 (1941), No. 9, pp. P226-P230, P238, figs. 9).—In continuation of this study (E. S. R., 84, p. 139), the following four papers are presented:

III. *Use of rank correlation for comparison of data.*—This paper is summarized as follows:

"The nature and use of the Kendall coefficients of rank correlation and of concordance are presented, with details of the methods of computation involved. They are found to be superior to the Spearman coefficient previously used both as a matter of convenience and of statistics. This discussion is given in anticipation of the papers immediately following in this series, which will make frequent use of the Kendall rating system."

IV. *A comparison of certain methods of measuring stiffness in fabrics.*—Quantitative comparisons of various methods for measuring fabric stiffness are discussed. The four different types of stiffness tests considered are the hanging heart loop test of Pierce and the tests with the Gurley stiffness tester, the Schiefer flexometer, and the drapeometer (E. S. R., 85, p. 142). Application of the analysis of variance to the interpretation of test results of this character is given with numerical examples.

V. *Comparison of the stiffness of a cotton fabric given different treatments and finishes.*—Previous papers having dealt with the nature of the properties it was desired to measure, with the types of apparatus available, and with the mathematical technics required for adequate analysis of the data, the present paper deals with a quantitative comparison of the four methods and with application of the mathematical technics previously discussed to data obtained on the several instruments described. It is pointed out that of the four methods described, the Pierce hanging heart loop test and the drapeometer

possess the merits of sensitivity, simplicity, low initial cost of apparatus, and duplication of results. "The factors inherent to the specimen are shown to be possible of investigation by the proper combination of several test methods. Further uses of rank correlation and application of the analysis of variance are made."

VI. *The effect of relative humidity on flexibility; test methods for the drapeometer.*—"The relative humidity has been shown to have a definite effect on fabric stiffness. The stiffness increases as the relative humidity is lowered. Methods of handling the drapeometer are given."

The evaluation of water-resisting textile finishes, G. A. SLOWINSKE (Amer. Dyestuff Rptr., 30 (1941), No. 1, pp. P6-P12, figs. 7).—Methods under consideration by the committee of the American Association of Textile Chemists and Colorists on the waterproofness of fabrics are presented. It is considered basic to the standardization of procedures to accept that "waterproof" means impervious to water and air-resistant, and "water-resistant" means resistant to water and porous to air. The general testing procedures variously used in the trade are discussed briefly. It is pointed out that these serve to evaluate three distinct properties possessed by water-resisting textiles, namely, (1) strong resistance to water under some pressure, (2) moderate resistance to penetration by falling water such as rain, and (3) resistance to actual wetting by water. Three simple testers—(1) a hydrostatic pressure tester, (2) a spray tester, and (3) an immersion tester, found satisfactory for these measurements in actual use—are described briefly, and the structural details of the instruments are illustrated by photographs and diagrams. The principle of action and detailed procedure for use of the tester and for taking a reading are considered in each case. The general utility of the three proposed testers is illustrated with data obtained by their use in tests on 12 representative fabrics of various nature. The general accuracy and precision of the three testers are discussed and illustrated by data.

Factors affecting the fading of dyed textiles by radiant energy, M. LUCKIESH and A. H. TAYLOR (Amer. Dyestuff Rptr., 29 (1940), No. 21, pp. 543-546, 548, figs. 4).—Relative fading under (1) tungsten filament lamps (color temperature of 2,850° K.), (2) sunlight and light from a clear sky on a 45° plane facing south through $\frac{1}{8}$ -in. window glass (color temperature 6,000°), and (3) fluorescent daylight lamps (color temperature 6,500°) was studied in fading tests involving 120 dyed textile specimens, including silk, cotton, wool, viscose, and acetate. The exposure technic is briefly outlined, and curves are presented showing the energy distribution for equal footcandles from three sources of light.

The two artificial sources compared for equal fading required average exposures, based on daylight as 1.0, of 1.81 for the tungsten filament lamps (50- and 75-w. sizes) and 1.68 for the fluorescent daylight lamps, thus indicating that natural daylight generally produced more fading than either of the artificial illuminants for the same exposures in footcandle hours. For the most part the change in color upon exposure was independent of the light source used. The tests showed that the fading depended on the spectral character, i. e., wavelength and energy of the illuminant. Energy in the spectral region γ 3,000- γ 3,500 in sunlight was small in amount as compared with other spectral regions producing fading, and most of the fading in sunlight was found to be due to energy in the spectral region γ 3,000- γ 6,000.

With the tungsten filament and fluorescent daylight lamps about 50 percent of the 120 specimens showed susceptible fading after exposure for 50,000 footcandle hr. (500 hr. at 100 footcandles), although about half those showing fading were only very slightly faded. On the average the fading with a single

light source was approximately proportional to the exposure in footcandle hours, i. e., to the product of intensity of illumination and duration of exposure. Certain exceptions are noted, however. Spectral reflectance curves of the new and faded materials showed that the material bleached (reflectance increased) in the spectral region of maximum absorption, and darkened (reflectance decreased) in the region of minimum absorption. The resultant effect was to make the material either lighter or darker, depending upon the color.

A comparison of carbon tetrachloride, naphtha, and water for the cleaning of cellulose-acetate rayon, regenerated-cellulose rayon, wool, wild silk, silk, and weighted silks, F. BARR, A. J. MARSHALL, and R. EDGAR. (Iowa Expt. Sta.). (*Amer. Dyestuff Rptr.*, 29 (1940), No. 22, pp. 599-603).—Eleven plain-woven fabrics, including 1 black iron-weighted silk crepe and 10 undyed samples representing cellulose-acetate rayon faille taffeta, regenerated-cellulose rayon crepe, wool batiste, wild silk pongee, wild silk shantung, silk crepe, and lead-, tin-, lead-tin-, and zinc-weighted silk crepes, were used in this study. The following data are reported for these fabrics analyzed previous to dry-cleaning: Weight per square yard, distribution of yarns by number and by weight, yarn number, twist of yarn, breaking strength of fabric (conditioned and wet), and elongation at breaking load; and for the weighted fabrics, aqueous extract, ash (warp and filling yarns), and weighting element (aluminum, iron, lead, phosphorus, silicon, tin, and zinc) all expressed as percentage of fabric weight. The fabrics were cleaned in four different ways—(1) with carbon tetrachloride and soap, (2) with naphtha, (3) with naphtha and soap, and (4) with water and soap. Results of further examination of samples of each fabric as cleaned by each method are reported for the following: Weight per square yard, as percentage of original weight before cleaning; thickness of fabric, in thousandths of an inch; shrinkage of warp and filling yarns, as percentage of original weight; grayness of fabric, as percentage of light absorbed; percentage of ash; conditioned and wet breaking strengths for warp and filling yarns, as percentage of original conditioned strength; silk content of loaded and weighted fabrics; acetyl content of cellulose-acetate rayon; nitrogen content of silk; and nitrogen and sulfur content of wool. Data were reported earlier (E. S. R., 77, p. 284) for the effect of oxidizing agents on the new and weighted silks used in this study.

Textile fabrics in relation to drycleaning, P. B. MACK, C. R. PHILLIPS, and F. A. WELLER (*Pa. State Col. Bul.*, 34 (1940), No. 40, pp. [2]+83, figs. 24).—This publication, written to give a brief résumé of the characteristics of textile articles that make them satisfactory or unsatisfactory for cleaning, is intended for the use of consumers, home economics teachers, retail merchants selling textile merchandise, dry cleaners, and Better Business Bureau staff members who settle claims arising from unsatisfactory performance of textile articles. This résumé is based on a study of 937 analytical cases received in the laboratory during the past 5 yr., these having been too complicated for agreement between the dry cleaner and the consumer as to the cause of damage. The cases, grouped according to the type of damage, are tabulated to show the distribution with respect to the causes of the difficulties as ascertained from chemical, physical, and microscopical examination of the textile articles. As a basis for understanding why certain textile articles do not respond satisfactorily to dry cleaning, detailed consideration is given to the process itself and to the textile fibers. Dry-cleaning solvents are discussed, and the dry-cleaning process is covered thoroughly, first with a flow sheet showing the sequence of operations and then with detailed description of the various steps. The various textile fibers, including natural fibers of cellulose and of protein composition, rayons, Nylon, Vinyon, and fibers made from casein, soybeans, glass, and metal, are considered in detail with respect to origin, chemical nature, appearance (as

described and illustrated by photomicrographs), and physical and chemical characteristics, particularly as these would have bearing on the response of the fiber to cleaning. Following this, consideration is given to fabric weaves, dyestuffs, and finishes from the standpoint of successful dry cleaning. The final chapter is devoted to an analysis of the 937 articles damaged during dry cleaning. The types of damage observed, such as changes in shape or size, color changes, color bleeding, change in surface character, and others are discussed and illustrated by many fine photographs.

Present status of mothproofing, H. F. HERMANN (*Amer. Dyestuff Rptr.*, 29 (1940), No. 21, pp. 539-540).—This general article, written from the standpoint of the trade, notes pentachlorodioxytriphenylmethane sulfonic acid as a chemical of recent application in the treatment of fabrics to afford protection against damage by moths. This chemical, applied in an acid dye bath at a 1½-percent level, calculated on the weight of the material to be treated, protects against damage by moths and at a 2-percent level protects against the carpet beetle. It is considered to possess good fastness to scouring, washing, and light and excellent fastness to dry cleaning. The compound, losing from 4 to 5 percent of its concentration on a material at every washing, is calculated as being reduced from 2-percent concentration to 1.25-1.4 percent after 10 washings, thus offering protection to woolens during their average useful life. For materials which cannot withstand an acid dye bath, the use of a chlorinated phenylbenzylphosphonium compound applicable in a neutral bath is recommended. It is noted that there are moth-protective agents soluble in dry-cleaning fluids which may be applied at the time of dry cleaning, with renewal at each such cleansing. All mothproofing chemicals based on silico fluorides are unsatisfactory because of complete lack of fastness to water and washing.

A simple apparatus for testing flameproofed fabrics, E. W. AKIN and A. R. MACORMAC. (*Ala. Polytech. Inst.*). (*Amer. Dyestuff Rptr.*, 30 (1941), No. 4, pp. P91-P98, figs. 4).—Twelve methods in present use for testing flameproofed fabrics are described briefly, and some of their advantages and limitations are discussed. The new method described utilizes an apparatus sufficiently simple for use in classroom demonstrations to show whether or not fabrics are flameproofed. It consists of a box 10 by 10 by 30 in. in dimensions, with open top and front and fitted with a removable shelf placed 10 in. from the bottom. This supports the Bunsen burner, or the block, cork, and shallow metal container as arranged for an alcohol flame, which is placed beneath the 4 by 4 in. opening in a 10 by 14.1 in. board supported at a 45° angle by the shelf and the side of the box. A 6 by 6 in. piece of the fabric held firmly, face upward, in an embroidery hoop, is placed, with the face of the material toward the flame and the warp threads parallel to the face of the plane, over the opening and above the flame. Under the conditions of the test a fabric is considered flameproof if no flame is present on the fabric during the length of time it takes the alcohol to burn. The charred area should not extend to any edge of the hoop. If flaming does not occur, the shape of the charred area is that of an ellipse, but if flaming does occur, the upper edge of the charred area becomes enlarged due to the upward travel of the flame.

Tests were made with this apparatus, using 8-, 10-, 12-, and 14-oz. untreated canvas as test material and with a 1½-in. luminous flame from a ⅝-in. Bunsen burner at various distances from the cloth, or an alcohol flame from 0.1, 0.2, and 0.3 cc. of absolute alcohol in the metal cup placed 1 in. below the fabric. Tests with the Bunsen burner flame showed that the charred area on a fabric decreased proportionately as the weight of the fabric increased. Tests with an alcohol flame showed that it was necessary to have 0.3 cc. of absolute alcohol to produce

a flame sufficient to ignite untreated cloth. Tests made under ordinary atmospheric conditions were comparable to those made under standard conditions of 70° F. and 65 percent relative humidity. Tests with fabrics treated with several concentrations of a commercial flame-proofing agent indicated that the recommended concentration should be used, otherwise there was more danger from flash flaming than when the fabric was untreated.

MISCELLANEOUS

The relation between the design of an experiment and the analysis of variance, A. E. BRANDT. (U. S. D. A.). (*Jour. Amer. Statis. Assoc.*, 36 (1941), No. 214, pp. 283-292).—This is a paper presented before the American Statistical Association at Chicago, December 27, 1940.

List of publications of the United States Department of Agriculture from January 1936 to December 1940, inclusive, M. H. DOYLE (*U. S. Dept. Agr., Misc. Pub.* 443 (1941), pp. [1]+68).—This supplements the list previously noted (*E. S. R.*, 77, p. 141).

Twentieth Annual Report [of the Georgia Coastal Plain Station], 1940, S. H. STARR (*Georgia Coastal Plain Sta. Bul.* 31 (1940), pp. 150, fig. 1).⁹

Fifty-third Annual Report [of Texas Station], 1940, A. B. CONNER ET AL. (*Texas Sta. Rpt.* 1940, pp. 294).⁹

Abstracts of Bulletins 581-595, Circulars 86-90, and other publications during 1940, A. D. JACKSON (*Texas Sta. Cir.* 93 (1941), pp. 51).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere. Some of these have been previously abstracted or are noted elsewhere in this issue, but there are also abstracts of the following: Six Thistles Recently Introduced into Texas, by V. L. Cory (p. 18); Parthenogenesis in *Zephyrantheae*, and Cytological Confirmation of Taxonomy in *Cooperia*, both by W. S. Flory, Jr., (p. 18); and Gallatin Petrified Forests, by P. A. Young (p. 18).

Agricultura Experimental, [January-August 1941] (*Agr. Expt. [Puerto Rico. Univ. Sta.]*, 1 (1941), Nos. 1, pp. [8], figs. 8; 2, pp. [12], figs. 21; 3, pp. [8], figs. 12; 4, pp. [12], figs. 13).—In addition to articles noted elsewhere in this issue, No. 1 contains brief notes on this new series of publications; the food consumption of Puerto Rico; Puerto Rico se prepara para su defensa [Puerto Rico Prepares for Defense], by H. Cruz Monclova (pp. [4-5]); and Fabricacion de grasas en Puerto Rico [Making Fats in Puerto Rico], by J. H. Ramirez (p. [6]). No. 2 contains Continúan bajas las exportaciones de varios productos agrícolas importantes [Additional Data on the Exports of Various Important Farm Products], by S. L. Descartes (p. [5]), and Exhortacion a los cultivadores del algodono en Puerto Rico [Advice to Cotton Growers in Puerto Rico], by J. P. Rodríguez (pp. [6-8]). No. 3 contains El maiz en la defensa [Corn in Defense], by G. A. Lebedeff (pp. [4-5]), and Hechos económicos significativos referentes al cultivo de la caña de azúcar descubiertos en estudios de esta estacion [Economic Phases of Sugarcane Growing Revealed by the Station Studies], by S. L. Descartes (pp. [7, 8]). No. 4 contains articles entitled Panamericanismo en accion [Pan-Americanism in Action], by J. A. B. N[olla] (pp. [2-3]); Al Ecuador [Ecuador], by J. A. B. N[olla] (p. [1]) and J. I. Otero (pp. [4-5]); La zabila [The Zabila], by J. I. O[tero] (p. [11]); and La maya como fuente de enzima proteolítica [*Bromelia pinguin* as a Source of Proteolytic Enzymes], by C. F. Asenjo and M. del C. de Fernández (p. [12]).

⁹ The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Association of Land-Grant Colleges and Universities.—In addition to the general officers previously enumerated (E. S. R., 86, p. 5), the following section officers were elected at the Chicago meeting of November 10–12, 1941: Agriculture, A. L. Deering of Maine, chairman, L. E. Call of Kansas, vice chairman, and W. W. Clark of Wisconsin, secretary; engineering, E. B. Norris of Virginia, chairman, B. R. Van Leer of North Carolina, secretary; home economics, Genevieve Fisher of Iowa, chairman, Nora A. Talbot of Oklahoma, vice chairman, and Florence Harrison of Missouri, secretary; and graduate work, F. D. Kern of Pennsylvania, chairman, and W. C. Russell of New Jersey, secretary. Within the section of agriculture, the subsection of experiment station work elected H. P. Rusk of Illinois, chairman, and C. R. Orton of West Virginia, secretary; the subsection of resident teaching, H. H. Hume of Florida, chairman, and J. G. Lee, Jr., of Louisiana, secretary; and the subsection of extension work, P. E. Miller of Minnesota, chairman, and P. O. Davis of Alabama, secretary.

The committee on extension organization and policy was reorganized on a 4-year regional basis by the addition of J. E. Carrigan of Vermont, J. W. Burch of Missouri, and Lella R. Gaddis of Indiana for 4-year terms and the replacement for 3 years of L. R. Simons of New York, Ellen LeNoir of Louisiana, and H. J. C. Umberger of Kansas by L. A. Bevan of New Jersey, F. A. Anderson of Colorado, and May Cresswell of Mississippi. Other committee changes included the appointment to the committee on college organization and policy of C. L. Christensen of Wisconsin and Edmund E. Day of New York vice E. G. Peterson of Utah and C. A. Dykstra of Wisconsin. On the committee on instruction in agriculture E. L. Anthony of Michigan and E. O. Holland of Washington succeeded A. A. Hauck of Maine and W. C. Coffey of Minnesota; on instruction in engineering E. L. Moreland of Massachusetts and G. P. Stocker of Arkansas succeeded B. R. Van Leer of North Carolina and R. L. Wales of Rhode Island; and on instruction in home economics Annette T. Herr of Massachusetts and B. Eleanor Johnson of Arizona succeeded Minnie Price of Ohio and Margaret M. Justin of Kansas. On experiment station organization and policy M. F. Miller of Missouri and A. B. Conner of Texas were succeeded by Clarence Dorman of Mississippi and C. E. F. Guterman of New York, and Statie E. Erikson of Kentucky on the home economics subcommittee by Jessie W. Harris of Tennessee; and on military organization and policy L. N. Duncan of Alabama by H. W. Caldwell of Georgia. In the special committees W. A. Schoenfeld of Oregon, A. A. Potter of Indiana, and A. G. Crane of Wyoming were succeeded on the committee on radio by E. O. Holland of Washington, J. A. Hannah of Michigan, and S. V. Sanford of Georgia; Paul W. Chapman of Georgia on land-grant institutions for Negroes by L. N. Duncan of Alabama; L. R. Simons of New York on relationships by H. C. Ramsower of Ohio; E. H. White of Mississippi on rural youth by W. S. Brown of Georgia; and A. G. Crane of Wyoming on preservation of phosphate deposits and their national use by H. A. Curtis of Missouri. On the joint committee on projects and correlation of research S. B. Doten of Nevada was succeeded by P. S. Burgess of Arizona; and on publication of research S. W. Fletcher of Pennsylvania by W. H. Martin of New Jersey. H. L. Donovan of Kentucky became a delegate to the American Council on Education vice R. D. Hetzel of Pennsylvania.

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UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

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EDITOR: HOWARD LAWTON KNIGHT

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EXPERIMENT STATION RECORD

VOL. 86

March 1942

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IMPACTS OF THE WAR ON AGRICULTURAL SCIENCE AS INDICATED BY THE DECEMBER SOCIETY MEETINGS

So many of the scientific societies of agricultural interest hold their annual meetings in late December that this period normally assembles more research workers in agriculture than any other of the year. For this reason these gatherings furnish an unusual opportunity to obtain a cross section of current thought and trends in some of the most important fields. In this respect, the 1941 meetings were no exception. Although formulation of their programs was well advanced before Pearl Harbor, the war and its impacts inevitably permeated whatever was said and done.

Three main groups of these meetings were attended by representatives of the Office of Experiment Stations. The largest in point of numbers and constituent bodies was that at Dallas, Tex., centering around the American Association for the Advancement of Science and including among others the American Phytopathological Society, the Society for Horticultural Science, the Society of Plant Physiologists, and the Mycological Society, the Genetics Society, and the Potato Association of America. A second group was that of nation-wide social science societies, held in New York City and including among others the American Farm Management Association and the Rural Sociological Society of America. The third was held in San Francisco and included the American Association of Economic Entomologists and the Entomological Society of America. All of these groups were largely attended, and there was the customary substantial representation from the Federal Department of Agriculture and the land-grant colleges and experiment stations.

One of the organizations giving special attention to the war situation was the American Phytopathological Society. This society scheduled a panel discussion, sponsored by its extension work and relations committee and having as its topic for discussion Plant Pathology in Relation to National Defense and Post-War Readjustments. The meeting was opened by Director C. R. Orton of West Virginia, who took up the national emergency programs as to crop production

and garden goals and set forth the plant disease program involved. Other speakers drew attention to the opportunity for increased service to Latin America, the fungicide and spray machinery situation, and the need of better transmission of research findings to the farm. On this last point, it was stated that less than half the States now have extension plant pathologists. In an attempt to remedy some of the difficulties in this direction, a group of southern plant pathologists set aside their original program for a special conference to consider what they might do of a wartime value and formulated simple, specific directions for the control of tomato wilt, sweetpotato wilt, and other *Fusarium* wilts of southern crops.

The society as a whole voted to affiliate with the American Society of Agricultural Sciences (E. S. R., 83, p. 291). Thereby it became the first society in this country to effect association with this good-neighbor group established to promote helpful relationships among the agricultural scientists of the American Republics.

Probably the most significant action of the phytopathologists was their formation of a war emergency committee, consisting of their retiring president, Dr. J. G. Leach of West Virginia, Dr. E. C. Stakman of Minnesota, Dr. R. P. White, formerly of the New Jersey Stations, and their newly elected president, Dr. L. M. Hutchins of the U. S. D. A. Bureau of Plant Industry. Regional representatives for the New England, Middle Atlantic, Southern, Upper Mississippi Valley, and Pacific Divisions and representatives for plant quarantine, research, extension, and fungicide manufacture were also designated. A tentative program of war services dealt with such matters as the codifying for immediate use of existing information on plant disease prevention, an expanded extension service, redirection of current research programs toward emergency uses and increase of special emergency experimentation, reexamination of long-time basic research projects, intensification of plant disease survey work, tightening of plant quarantines, and the holding of regional conferences as a basis for developing coordinated action and research programs to meet war needs in the different areas. Reports were received from several States which indicated that already energetic work was proceeding within the experiment stations to reconstruct their departmental research programs to meet war emergency needs.

The Genetics Society of America adopted resolutions referring to the continuity of fundamental research, now destroyed by war in almost all parts of the world, as "probably the most important investment that can at present be made for the benefit of the post-war period." It urged upon Congress and the Federal Government "the importance of safeguarding the continued prosecution of fundamental research by those institutions which are now supported by Federal funds."

The sociological discussions in New York City centered very definitely around the war situation. One session dealt with rural population and national defense, and another with an agricultural program for defense and the post-war period. Rural health received emphasis in a number of programs, notably in an appeal by Dr. M. L. Wilson of the U. S. D. A. Extension Service for a wide use of our knowledge of nutrition in carrying out agricultural policy and by Miss Dorothy Dickens of Mississippi on the family and national defense. There was also a session on rural institutions and national defense, in which the school and the church received special attention. Still another set of papers dealt with the integration of social research in the Americas and cultural barriers to American solidarity. Much interest was shown by the rural sociologists as a group in the organization of their research for maximum effectiveness on a wartime basis and the need of making readily and widely available whatever findings could be synthesized and applied in emergency production.

The entomological meetings at San Francisco naturally drew their attendance largely from the Western States, but the problems considered in the various papers and conferences represented the major phases of national entomological effort. One of the most profitable sessions of the economic entomologists developed in the extension section where the entomologists' place in national defense was discussed. It was pointed out that 32 entomologists are following their profession as commissioned officers in the armed forces, 10 of whom are in the Navy and 22 in the Army. In other instances, professional entomologists are cooperating with military authorities in sand fly and mosquito control, location of camps, etc. The need for adjustments of long-time research projects was mentioned. It was pointed out that large-scale operations are probably essential during the present emergency. Several authorities on insecticides mentioned the shortage of various essential materials. For example, many of the oils needed in the West are now going for aviation purposes; rotenone can no longer be obtained in quantity; enough arsenic is difficult to get at the present time. The association reaffirmed its desire to be of service in any way possible during the present state of emergency and expressed its willingness to cooperate with other groups with which its service may be coordinated.

Thus regardless of the place of assembly or the field of special interest, we find agricultural science mobilizing to render a maximum of assistance. In these meetings plant pathologists in Dallas, rural sociologists in New York City, and economic entomologists in San Francisco alike demonstrated the solidarity of the personnel engaged in agricultural research in the Nation and by typically democratic procedures indicated distinct progress in reorganizing their work to meet the new conditions and needs.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), p. 29).—Work on the source and elimination of lead contamination in maple sirup is reported by C. H. Jones as finished, with a marked drop in the lead content of maple products resulting from the abandonment of terneplate and other soldered equipment.

The chemical composition and apparent digestibility of nutrients in smooth bromegrass harvested in three stages of maturity, J. SOTOLA. (Wash. Expt. Sta. and State Col.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 7, pp. 427-432).—The protein content of the dry matter of smooth bromegrass clippings, taken at regular intervals throughout the growing season, was found to decrease progressively from 13.61 to 4.02 percent. Crude fiber increased from 19.77 to 35.92 percent and plant height from 4.5 to 36 in. The calcium content declined from 0.37 to 0.24 percent and phosphorus from 0.32 to 0.13 percent during the same interval. It was further found that delaying the grazing of smooth bromegrass until it is 10 in. tall does not decrease the nutritive qualities, and the carrying capacity appears to be greatly increased. Bromegrass up to a height of 10 in. retains its highly digestible character. The dry matter was 81 percent digestible at the 4- and 10-in. stages and only 55.8 percent digestible at the 36-in. stage. Crude protein, crude fiber, and nitrogen-free extract followed similar trends. Smooth bromegrass retains its high nutritive qualities to a more advanced stage of maturity than does crested wheatgrass, and at identical stages of growth is superior to it in digestible crude protein and total digestible nutrients.

Estudios sobre la raíz de la yuca [Cassava roots] (*Puerto Rico Univ. Sta. Bien. Rpt.* 1939-40, *Span. ed.*, pp. 54-56).—Work reported upon under this heading by H. Cruz Monclova includes analyses of three varieties of cassava roots.

Effect of cupric oxychloride cement on microorganisms, M. A. FARRELL and R. T. WOLFF. (Pa. State Col.). (*Indus. and Engin. Chem.*, 33 (1941), No. 9, pp. 1185-1188, fig. 1).—Growth of molds (8 dermatophytic species) was markedly inhibited after contact with cupric oxychloride cement ("Hubbel-lite"); that of bacteria (18 species of 12 genera from various substrates) was inhibited by a longer exposure and to a less marked degree. The toxic properties of this cement were retained after washing for 6 hr. in running water.

Determination of nitrate-nitrogen with a photoelectric colorimeter, T. O. BERGE. (N. Dak. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 3, pp. 185-191, figs. 3).—The limitations of the phenoldisulfonic acid method for soil nitrate-nitrogen determinations are considered with a view toward development of a more rapid, sensitive, and accurate technic. The use of the Evelyn photoelectric colorimeter¹ was found to be especially valuable for making accurate and rapid measurement of nitrate content as given by the phenoldisulfonic acid method. The colorimeter was found to be especially valuable in the presence of extrane-

¹ Evelyn, K. A., *Jour. Biol. Chem.*, 115 (1936), No. 1, pp. 63-75, figs. 3.

ous colors, semiturbid solutions, and small amounts of nitrates. Standard solutions are not needed after the instrument has been calibrated.

New equipment for wheat quality testing, R. H. HARRIS (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 4-6, figs. 2).—The recording dough mixer has been scaled down to a "micro" size which has many mechanical features in common with the larger machine, and which may be enclosed in an air-conditioned cabinet to prevent environmental influences from affecting the results. Smaller quantities of flour than are required by the larger mixer can be used, and less time is consumed in making a test. The curves produced by the micro mixer resemble in general those drawn by the larger machine. The use of smaller quantities of flour is very desirable in plant-breeding and plant-nutrition studies, in which the quantity of available material is necessarily limited.

Farm production of sugarcane sirup, C. F. WALTON, JR., E. K. VENTRE, M. A. McCALIP, and C. A. FORT (*U. S. Dept. Agr., Farmers' Bul.* 1874 (1941), pp. II+38, figs. 14).—This publication describes recent improvements in the procedures recommended for making sirup of better and more uniform quality. The equipment and methods described are those most practicable for small farm or community plants. Considered are the use of sugarcane for sirup; production of sugarcane sirup in the United States; composition of sugarcane juice; harvesting; location, lay-out, and size of the plant; extracting, treating, and evaporating the juice; how to prevent sugaring; removing sediment from sirup; canning; marketing; cost of making sirup; composition and food value; and byproducts.

Commercial production of dessert wines, M. A. JOSLYN and M. A. AMERINE (*California Sta. Bul.* 651 (1941), pp. 186, figs. 14).—Following a brief introduction and a few pages concerned with the economic status of the California wine industry, the authors take up the types and composition of dessert wines; the principles of their manufacture; winery design, equipment, and operation; directions for making red dessert, sweet, white dessert, and sherry and other rancio-flavored wines and vermouth and related products; grape concentrate and caramel sirup; clarification and stabilization; preparation for marketing; bacterial diseases and other disorders of dessert wines; and analyses. Selected references for further reading are appended.

Commercial production of brandies, M. A. JOSLYN and M. A. AMERINE (*California Sta. Bul.* 652 (1941), pp. 80, figs. 9).—This bulletin contains an introduction and a résumé of the economic status of the industry in California, together with sections on the composition of brandies and the factors influencing it, classification of brandies, principles of brandy making, distillery operation, preparation for market, analysis of beverage and fortifying brandies, and selected references for further reading, and an index. The problems of the California beverage-brandy industry are discussed.

AGRICULTURAL METEOROLOGY

Climate and man: Yearbook of Agriculture 1941 (*U. S. Dept. Agr. Yearbook 1941*, pp. XII+1248, figs. 501).—This volume is the sixth in this series (*E. S. R.*, 84, p. 686) on some major aspect of science fundamental to our agricultural resources. Following a foreword by C. R. Wickard, and a summary by G. Hambidge (pp. 1-64), the volume is subdivided into five parts, as follows:

Part 1. *Climate as a world influence*.—Climatic Change Through the Ages, by R. J. Russell (pp. 67-97) (coop. La. State Univ.); Climate and the World Pattern, by D. I. Blumenstock and C. W. Thornthwaite (pp. 98-127); and The How and Why of Weather Knowledge, by F. W. Reichelderfer (pp. 128-153).

Part 2. *Climate and agricultural settlement.*—The Settlement of the Humid East, by C. O. Sauer (pp. 157–166) (Univ. Calif.); Climate and Settlement of the Subhumid Lands, by G. T. Trewartha (pp. 167–176) (Univ. Wis.); Climate and Settlement in the Great Plains, by C. W. Thornthwaite (pp. 177–187); Climate and Settlement of the Arid Region, by R. W. Bailey (pp. 188–196); Settlement and Cultivation in the Summer-Dry Climates, by J. Leighly (pp. 197–204) (Univ. Calif.); The Colonization of Northern Lands, by V. Stefansson (pp. 205–216); Climate and Settlement in Puerto Rico and the Hawaiian Islands, by J. Thorp (pp. 217–226); Climate and Future Settlement, by J. O. M. Broek (pp. 227–236) (Univ. Calif.); Comfort and Disease in Relation to Climate, by J. Hirsh (pp. 237–245); and Health in Tropical Climates, by R. G. Stone (pp. 246–261).

Part 3. *Climate and the farmer.*—Climate and Soil, by C. E. Kellogg (pp. 265–291); Effects of Climatic Factors on Growing Plants, by A. C. Hildreth, J. R. Magness, and J. W. Mitchell (pp. 292–307); Influence of Climate and Weather on Growth of Corn, by M. T. Jenkins (pp. 308–320); Climate and Small Grains, by S. C. Salmon (pp. 321–342); Climate and Sorghum, by J. H. Martin (pp. 343–347); Climate and Cotton, by C. B. Doyle (pp. 348–363); Climate and Tobacco, by W. W. Garner (pp. 364–372); Climate and Vegetable Crops, by V. R. Boswell and H. A. Jones (pp. 373–399); Climatic Adaptation of Fruit and Nut Crops, by J. R. Magness and H. P. Traub (pp. 400–420); Climatic Relations of Sugar-cane and Sugar Beet, by E. W. Brandes and G. H. Coons (pp. 421–438); Climate and Forage Crops, by O. S. Aamodt (pp. 439–458); Climate and Grazing, by W. R. Chapline and C. K. Cooperrider (pp. 459–476); Climate and the Nation's Forests, by R. Zon (pp. 477–498); Climate and Plant Diseases, by H. B. Humphrey (pp. 499–502); Insects and the Weather, by J. A. Hyslop (pp. 503–507); Climate and Livestock Production, by A. O. Rhoad (pp. 508–516); and Climate in Relation to Worm Parasites of Livestock, by J. T. Lucker (pp. 517–527).

Part 4. *The scientific approach to weather and climate.*—Flood Hazards and Flood Control—The Hydrologic Cycle, by Benjamin Holzman (pp. 532–536), Some Climatic Factors That Affect Run-Off, by G. W. Musgrave (pp. 536–545), Evaporation and Transpiration, by C. W. Thornthwaite and B. Holzman (pp. 545–550), Storms and Floods, by B. Holzman and A. Showalter (pp. 551–557), Snow Melt, by C. L. Forsling (pp. 557–560), Land Use in Flood Control, by A. C. Ringland and Otto E. Guthe (pp. 561–565), and Flood Forecasting, by M. Bernard (pp. 565–578); How the Daily Forecast is Made, by C. L. Mitchell and H. Wexler (pp. 579–598); The Scientific Basis of Modern Meteorology, by C. G. Rossby (pp. 599–655); and Amateur Forecasting From Cloud Formations, by C. G. Rossby (pp. 656–661).

Part 5. *Climatic data, with special reference to agriculture in the United States.*—World Extremes of Weather (p. 664); The Climates of the World, by W. W. Reed (pp. 665–684); Climate and Weather Data for the United States, by J. B. Kincer (pp. 685–699); Climates of the United States (pp. 701–747); Climates of the States (including, for each State, climatic summary tables, precipitation and temperature tables, special frost tables, maps, and supplementary climatic notes by various authors) (pp. 749–1210); and Climates of the Territories and the West Indian Islands (pp. 1211–1228).

Physical climatology, H. LANDSBERG (*State College: Pa. State Col., 1941, pp. XII+283, figs. 79.*)—The four chapters of this book deal, respectively, with collection and use of climatic data, climatological elements, composition of climatic elements, and applied climatology.

Climate: The limiting factor in Hand County Agriculture, D. C. MYRICK. (Coop. S. Dak. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, F. M. 25,*

pp. [3]+50, figs. 5).—The author summarizes climatic conditions in relation to agriculture in this South Dakota area over 78 seasons (1862–1939). In 60 percent of the seasons significant limits were put on crop yields by climate. This factor is discussed as it relates to agricultural planning.

Notes on the climate of the south Chinese-Tibetan borderland, J. HANSON-LOWE (*Geog. Rev.*, 31 (1941), No. 3, pp. 444–453, figs. 3).

A new coefficient of humidity and its application to the United States, P. E. CHURCH and E. M. GUEFFROY (*Geog. Rev.*, 29 (1939), No. 4, pp. 665–667, figs. 2).—The authors have tested A. Ångström's coefficient of humidity² by constructing January and July maps of the United States, using data from the climatic summaries published by the U. S. Weather Bureau, and computing coefficients for 548 stations and drawing the isopleths. There is a discussion of the value of this coefficient of humidity, which attempts to express soil moisture conditions, toward a surplus or deficiency of water, by a numerical figure.

Tree-ring analysis and dating in the Mississippi drainage, F. HAWLEY (*Chicago: Univ. Chicago Press*, [1941], pp. XI+110, pls. 8, [fig. 1]).—Two papers are appended: Reflection of Precipitation and Temperature in Tree Growth of the Central Mississippi Area, by M. M. Wedel and F. Hawley (pp. 45–49), and A New Dendrochronograph, by E. J. Workman and F. Hawley (pp. 101–103). Over six pages of references are given.

Monthly Weather Review, [June–August 1941] (*U. S. Mo. Weather Rev.*, 69 (1941), Nos. 6, pp. 169–200, pls. 10, figs. 9; 7, pp. 201–227, pls. 10, figs. 4; 8, pp. 229–256, pls. 10, figs. 18).—In addition to meteorological, climatological, solar radiation, and sunspot data, the following papers are included:

No. 6.—The Midwest Storm of November 11, 1940, by A. J. Knarr (pp. 169–178).

No. 7.—The Areal Distribution of Mean Annual Rainfall Over the Island of Hispaniola, by L. Alpert (pp. 201–204); Calibration of a Weather Bureau Tipping-Bucket Raingage, by D. A. Parsons (p. 205) (U. S. D. A.); and An Alternative Form of Potential Vorticity, by H. Arakawa (p. 206).

No. 8.—A New Type of Temperature Graph for the Geographer, by G. F. Deasy (pp. 229–232); and Some Pressure-Precipitation Trend Relations, by J. B. Kincer (pp. 232–235).

Hydrologic studies (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, SCS-TP-39, pp. [445], figs. [274]; SCS-TP-41, pp. [239], figs. [144]).—The first of these compilations of rainfall and run-off data deals with the watersheds of the Shelby Loam and Related Soils Conservation Experiment Station, Bethany, Mo., 1933–40, by A. W. Zingg (coop. Mo. Expt. Sta.); the second with the watersheds of the Arkansas-Louisiana-East Texas Sandy Lands Conservation Experiment Station, Tyler, Tex., 1931–39, by O. C. Word, Jr. (coop. Tex. Sta.).

Daily river stages at river gage stations on the principal rivers of the United States, M. BERNARD (*U. S. Dept. Agr., Weather Bur., Daily River Stages*, 36 (1938), pp. III+170, pl. 1).—This is the usual annual volume (E. S. R., 82, p. 260) continuing the record through 1938.

Soil and water conservation instruments.—I, Notes on the operation of the Fergusson recording rain and snow gage, D. A. PARSONS and F. W. BLAISDELL (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, SCS-TP-44, pp. [1]+24, figs. 3).

Flood-forecasting service in Pennsylvania, J. W. MANGAN (*Jour. Amer. Water Works Assoc.*, 33 (1941), No. 2, pp. 213–218).

² *Geog. Ann.*, 18 (1936), pp. 245–254.

SOILS—FERTILIZERS

[Soil investigations at the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 59-64*).—Work is noted by B. G. Capó, F. Famírez Silva, J. A. Bonnet, P. Richardson, and F. Méndez on the quantities of assimilable nutrients in Puerto Rico soils and increase in crop yields due to fertilizer applications.

[Soil investigations by the Vermont Station] (*Vermont Sta. Bul. 475 (1941), pp. 20-21, 22*).—Investigations are reported by A. R. Midgley on the following: Effect of various amendments on the conservation of cattle manure, effect of lime and organic matter on boron fixation and availability in soils, and effect of slope, plant cover, and contour tillage on erosion and water run-off on permanent pastures.

Morphological classification of soil structure, C. C. NIKIFOROFF. (U. S. D. A.). (*Soil Sci., 52 (1941), No. 3, pp. 193-211, pls. 2*).—A detailed discussion of a system of soil-structure classification is presented. Soil structure is considered as denoting an arrangement of the soil material in which the primary particles of such a material are held together by ties stronger than the ties between adjacent aggregates. Soil structure is classified into types, classes, grades, and species.

A double centrifuge tube for the separation of soil minerals by means of heavy liquids, C. D. JEFFRIES. (Pa. Expt. Sta.). (*Soil Sci., 52 (1941), No. 2, pp. 167-171, pl. 1*).—A double centrifuge tube has been devised which is found to meet the requirements for completeness of separation of soil minerals. The equipment and method of procedure is described in detail.

Warren County soils, H. WASCHER and R. S. SMITH (*Illinois Sta. Soil Rpt. 70 (1941), pp. 30, figs. 11, map 1*).—This survey adds 342,270 acres to the total area covered by the State soil survey (E. S. R., 84, p. 442).

Natural land types of Massachusetts and their use, A. B. BEAUMONT (*Massachusetts Sta. Bul. 385 (1941), pp. 16, figs. 2*).—Soil type, slope, stoniness, and erosion were mapped in detail for 48 soil types in 17 series on 13,211 acres. Slope was shown to be an important factor affecting land use in dairy farming. Stoniness, however, was found to be more important. Slight erosion was found to be the predominant type. Only 3.8 percent of the area surveyed showed no erosion, thus indicating that erosion was quite extensive. The classification of land into types based on natural characteristics is illustrated by means of the categories set up for one county. It is suggested by the author that this classification is of special value in connection with large-scale planning. The proposed classification is based on information given in the soil surveys of the State and on other factors obtained from a small amount of field work. The author suggests that, since this classification is a natural one, it must be applied in connection with economic and social factors.

An experimental study on the development of adobe structures in soils, C. W. CHANG. (Calif. Expt. Sta.). (*Soil Sci., 52 (1941), No. 3, pp. 213-227, pls. 2, figs. 3*).—Adobe structure may be determined by the drying and breaking of fine-textured soils. If the macroaggregates produced on breaking have smooth cleavage planes and angular edges, the soils possess typical adobe structure. The presence or absence of typical adobe structure is not correlated with particle-size distribution; swelling and shrinkage; moisture equivalent; base-exchange capacity; absorbed Ca, Mg, or Na; pH; vapor-pressure curves of the colloidal fraction; or type of clay present. Typical adobe structure appears to be distinguished by relatively great resistance to crushing pressure, low destructible porosity, high dispersion ratio, low percentage of water-stable aggregates, and high angularity

of the macroaggregates. A large amount of montmorillonitic clay in soils will tend to give rise to adobe structure, whereas a small amount of total clay or a large amount of kaolinitic clay or even of flocculated montmorillonitic clay will give rise to nonadobe structures. Kaolinitic clays, if properly dispersed, however, also may develop macroaggregates having smooth plane surfaces and angular edges and, therefore, may also produce adobe structure.

Soils in relation to fruit-growing in New York.—XV, *Seasonal and soil influences on oxygen and carbon-dioxide levels of New York orchard soils*, D. BOYNTON ([*New York*] *Cornell Sta. Bul.* 763 (1941), pp. 43, figs. 7).—In this contribution (E. S. R., 81, p. 43), evidence is presented that in the soil air, other conditions remaining constant, the oxygen percentage decreases and carbon dioxide percentage increases with increased depth, increased temperature, and decreased air space in the soil pores. During the greater part of the growing seasons included in the study oxygen stayed close to 20 percent and carbon dioxide below 1 percent of the soil-air volume in gas samples collected at the 1-ft. depth. Soils having less than about 10 percent of their volume as pore space unoccupied by water when they are at field-moisture capacity may be poorly drained at times. In two of the heavier profiles studied, as the ground water receded below the 3-ft. depth the oxygen content of the soil air at 3 ft. increased markedly. Frequently a month or more elapsed before the oxygen level attained a maximum. It was apparent that with some soil layers drainage in itself may not result in good aeration. Apparently anaerobic conditions may exist at times in the macropore space of orchard subsoils, and restricted oxygen content and high carbon dioxide content may occur. It is considered probable that both the analysis of the gas in the macropores, and the quantity and distribution of pore space in which there is opportunity for gas exchange with the outer atmosphere, should be considered in estimating the aeration of a soil layer. It is concluded, tentatively, that the larger pores may serve not only as drainage channels and as aerating systems, but also in influencing the ramification of roots.

Movement of carbon disulfide vapor in soils, R. M. HAGAN (*Hilgardia* [*California Sta.*], 14 (1941), No. 2, pp. 83-118, figs. 13).—The relation between each of several soil factors and the movement of carbon disulfide through the soil are considered. A method is presented for measuring the movement of vapor through the soil under carefully controlled soil conditions. Although specifically designed for this problem, the author suggests that the method may be useful in general studies on soil aeration and structure.

Chlorate distribution and the effect of nitrate concentration on chlorate toxicity in soil columns, R. S. ROSENFELS and A. S. CRAFTS. (Coop. U. S. D. A.). (*Hilgardia* [*California Sta.*], 14 (1941), No. 2, pp. 71-79).—The use of sodium chlorate in weed control has created a need for more information on the action of chlorate in the soil. In experiments with four soils to determine whether a percolating solution of chlorate may wash the nitrate out of the upper layers and concentrate it near the bottom of the soil column, it was found that when sodium chlorate percolates through a column of soil some of the nitrate of the soil is washed down to lower levels. The concentration of the nitrate produced by this washing down reduces the toxicity of chlorate. In view of this fact, the killing effect on deep-rooted plant may not be so great as it is near the surface, even though the chlorate concentration may be uniform throughout the depth penetrated.

Proper land use leads to conservation, W. J. LIDDELL (*Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 9, p. 1).—A general discussion of the economic and social implications of soil conservation. The relation of soil conservation to national defense is emphasized.

Erosion and related land use conditions on the West Tauy Creek demonstration project, Kansas, R. G. DUNMIRE (*U. S. Dept. Agr., Soil Conserv. Serv., Erosion Survey, 1940, No. 21, pp. [1]+25, figs. 10, map 1*).—This is a continuation of the series previously noted (*E. S. R.*, 85, p. 733).

Progress report of the Navajo Soil and Water Conservation Experiment Station, Mexican Springs, New Mexico, 1934-1939, D. S. HUBBELL, J. L. GARDNER, and G. L. SHERMAN (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, SCS-ESR-9, pp. [99], figs. 17*).—This report presents a discussion of the general problem area along with a detailed account of the climatic, land use, soils, and geologic relations of the problem-area proper. Results of investigations designed to determine run-off characteristics from small and large watersheds and the effect of diverting arroyo waters on range and farm lands are presented.

Devising methods for controlling erosion on New Hampshire potato fields. (Coop. U. S. D. A.). (*New Hampshire Sta. Bul. 330 (1941), pp. 24-25*).—Erosion data by W. H. Lyford are noted.

Cropping systems that help control erosion, O. E. HAYS and N. CLARK. (Coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 452 (1941), pp. 23, figs. 12*).—This is an illustrated publication showing the effect of undesirable and desirable cropping practices on soil and water losses. Based on soil losses from the soil conservation experiment station at La Crosse, it was found that the 3-yr. rotation commonly practiced in the area does not give adequate control of erosion except under very limited conditions. Based on the results of the La Crosse experiments, the authors present recommendations for various cropping practices providing for the best use of the land.

A revised nomenclature of forest humus layers for the northeastern United States, S. O. HEIBERG and R. F. CHANDLER, JR. (Cornell Univ. et al.). (*Soil Sci.*, 52 (1941), No. 2, pp. 87-99, pls. 3).—Various types of forest humus layers are described in sufficient detail to enable the soil surveyor to recognize them in the field without the assistance of experienced identification.

Mineral composition of freshly fallen white pine and red maple leaves, W. H. LYFORD, JR. (*New Hampshire Sta. Tech. Bul. 77 (1941), pp. 12*).—The author reports determinations of the ash content and the composition of the ash of the foliage from red maple and from white pine growing in Gloucester, Brookfield, Essex, Paxton, and Woodbridge soils. The red maple leaves from the trees on Gloucester sandy loam averaged 6.21 percent of ash, of which about one-third was silica. Pine needles from trees on the same soil averaged 2.62 percent of ash, of which about one-seventh was silica. The red maple leaves had a calcium content lower than that of the pine needles. There was a tendency toward constancy from one year to another where high ash content was observed, but material from the same species on the same soil type showed considerable variation in ash composition from one site to another. Also, in years when the red maple leaves had a high content of ash components, pine needles grown nearby had a low ash-component content and vice versa. No outstanding differences due to soils may be expected in the ash analyses of the leaves of red maple and white pine growing on Gloucester, Brookfield, Essex, Paxton, or Woodbridge soils.

Synthetic soil as a bacteriological culture medium, H. J. and J. E. CONN. (N. Y. State Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 2, pp. 121-136).—Because of soil deterioration when used as a medium for the cultivation of soil bacteria, as well as the complex composition of natural soil, efforts are reported on the development of a synthetic soil in which the bacteriological phenomenon could be studied with fewer complicating factors. A formula for a synthetic soil is given.

A critique of field experiments with plant nutrients, O. W. WILLCOX (*Amer. Fert.*, 95 (1941), Nos. 5, pp. 5-7, 26; 6, pp. 8-11, 24, 26, figs. 2).—A general discussion is presented on the importance of careful planning in establishing experiments so that the results may be analyzed statistically. It is pointed out that when an analysis of variance shows that a visible increase is not significant, the experimenter may find valuable assistance by determining the positions of the experimental yields in relation to the Mitscherlich-Baule normal yield curve.

Laboratory, greenhouse, and field methods of studying fertilizer needs of orchard soils, R. E. STEPHENSON and C. E. SCHUSTER. (Oregon Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 52 (1941), No. 2, pp. 137-153).—Results of chemical, greenhouse, and field tests on soils used for orchard cover crops are considered. It is pointed out that no test which fails to give adequate consideration to the physical properties of the soil can be considered a proper basis for orchard soil management practices. It is suggested that physical and chemical tests should be accompanied by greenhouse trials to provide information on the various elements present. These should be followed by long-time trials where the cumulative effect of various fertilizers over a period of years may be established.

Putting fertilizer where it can do the most good, F. E. BEAR. (Rutgers Univ.). (*Com. Fert.*, 63 (1941), No. 4, pp. 26-29).—Several of the factors affecting the efficient utilization of plant nutrients applied to the soil are reviewed. The effect of the method of application of fertilizers in relation to utilization is given special emphasis. The beneficial response from proper placement of fertilizers for potato production is cited as an example of what may be accomplished through proper placement of fertilizers. The need for additional information on the placement of fertilizers for other crops is indicated.

Use of liquid fertilizers for growing vegetables, V. A. TIEDJENS. (N. J. Expt. Stas.). (*Agr. News Letter*, 9 (1941), No. 2, pp. 17-21; also in *Com. Fert.*, 63 (1941), No. 4, pp. 10, 12-13).—A general discussion of the principles, methods, and equipment involved in the use of liquid fertilizers for growing vegetables. The author points out that liquid fertilizer formulas are low in calcium because it is impossible to have appreciable amounts of calcium and phosphoric acid both in solution. It is indicated that if liquid fertilizers are used a good liming program should be followed.

Forty-year studies of nitrogen fertilizers, A. L. PRINCE, S. J. TOTH, A. W. BLAIR, and F. E. BEAR. (N. J. Expt. Stas.). (*Soil Sci.*, 52 (1941), No. 4, pp. 247-261, figs. 2).—The authors present a summary of 40 years' results of cylinder studies with Penn loam soil, involving a comparison of nitrogenous fertilizer materials as determined by the yield of dry matter, the amount of nitrogen in harvested crops, percentage recovery of applied nitrogen in the harvested crops, and the residual effects on the soil. In addition, data are presented on the status of the exchange complex of the soil on which the experiments were conducted.

Factors influencing the availability of the indigenous phosphorus in an acid tropical soil, J. E. A. DEN DOOP (*Soil Sci.*, 52 (1941), No. 2, pp. 101-120, fig. 1).—Results are reported on the effect of crop residues on the availability of indigenous phosphorus in a Java soil. The author suggests that improvement in availability of indigenous phosphorus is brought about by macrobiotic and microbiotic processes. The combined action or cooperation is suggested to consist of the utilization by soil micro-organisms of the sun's energy which was stored in the organic materials and which was liberated from the crop plants and placed at the disposal of the soil micro-organisms. In order to utilize the organic

materials the soil micro-organisms need potassium fertilizer for their own use. Nitrogen fertilizer would also be expected to benefit the action. The importance of utilization of organic residues in tapioca culture is emphasized.

Soil studies with radioactive phosphorus: Significance of biological measurements of the retention of applied phosphorus by soils, S. S. BALLARD and L. A. DEAN. (Hawaii Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 3, pp. 173-183, pl. 1, figs. 2).—The extent of retention of applied phosphorus to the soil was studied by growing tomatoes in various soil and sand cultures to which radioactive phosphorus had been added. Results are also recorded on a comparison of chemical and biological methods for determining the phosphorus-fixing capacity of soils. This soil and species of plant grown were found to affect the rate and total amount of radioactive phosphorus absorbed. The percentage of phosphorus fixation found for various soils was found to be closely related to the values obtained from chemical laboratory studies on the sorption from soil-water systems.

Some effects of volume rate of solution supply and of potassium concentrations on the growth of white clover, G. H. AHLGREN. (N. J. Expt. Stas.). (*Soil Sci.*, 52 (1941), No. 3, pp. 229-235, pl. 1).—Results are reported on the effect of various potassium concentrations and volume rate of solution supply on the culture and yield of white clover grown under greenhouse conditions. Plants supplied daily at the rate of 1 l. with solutions containing 1, 4, and 16 p. p. m. of potassium showed potassium-deficiency symptoms, whereas when 4 l. of these same solutions were supplied daily the deficiency symptoms were greatly reduced at 1 and 4 p. p. m. and had completely disappeared with the 15 p. p. m. treatment of potassium.

Effect of certain orchard practices on the potassium status of a New York fruit soil, W. REUTHER. (Cornell Univ.). (*Soil Sci.*, 52 (1941), No. 2, pp. 155-165).—Investigations are reported on the effect of mulch on the exchangeable potassium content of a New York orchard soil in the Dunkirk series and on the effect of farm manure on the potash status of an orchard soil. The use of liberal amounts of straw mulch or farm manure markedly increased the exchangeable potassium content of the soils under study. The high potassium content of mulch materials should be given more attention in the evaluation of the effects of mulching as an agricultural practice.

The importance of sodium for plant nutrition, I, J. J. LEHR (*Soil Sci.*, 52 (1941), No. 3, pp. 237-244, fig. 1).—The effect of sodium on certain crops and the importance of sodium in relation to potassium are considered. It is indicated that while sodium is not as important as potassium there are several conditions where sodium might be applied to advantage.

The value of liming soils, R. COLEMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, pp. 1-2, 7).—The importance of calcium and magnesium in plant growth is discussed. It is pointed out that the cheapest and easiest method of correcting soil acidity and supplying calcium and magnesium is through the use of dolomitic limestone.

AGRICULTURAL BOTANY

The world of plant life, C. J. HYLANDER (*New York: Macmillan Co.*, 1939, pp. XXII+722, [pl. 1, figs. 438]).—"This book was planned and written with the specific purpose of making the laymen familiar with a few of the interesting plants, both native and introduced, which are found in the United States."

The plant world: A text in college botany, H. J. FULLER (*New York: Henry Holt & Co.*, [1941], pp. XI+592, [pls. 2], figs. 306).

The diagrammatic representation of the results of physiological and other experiments designed factorially, F. J. RICHARDS (*Ann. Bot. [London], n. ser., 5 (1941), No. 18, pp. 249-261, figs. 4*).—"A type of diagram is described that enables the results of any experiment of factorial design, including the various interaction effects, to be presented fully and concisely in one plane. Examples of diagrams illustrating the $2 \times 2 \times 2$, $2 \times 2 \times 2 \times 2$, 3×3 , and $3 \times 2 \times 2$ layouts are given and discussed."

The technique and use of mass collections in plant taxonomy, E. ANDERSON (*Ann. Missouri Bot. Gard., 28 (1941), No. 3, pp. 287-292, fig. 1*).

Allium coryi, M. E. JONES, H. B. PARKS. (Tex. Expt. Sta.). (*Herbertia, 7 (1940), pp. 84-87, fig. 1*).—Description and notes are given on this Texas species of onion, which is adapted to both hot dry and moist cool conditions as well as to high and low altitudes. Its excellence as an ornamental is stressed.

A checklist of Amaryllidaceae, tribe Allieae, in the United States, C. V. MORTON (*Herbertia, 7 (1940), pp. 68-83*).

Species Batorum: The genus *Rubus* in North America.—III, Setosi, L. H. BAILEY (*Gentes Herbarum, 5 (1941), No. 3, pp. 127-198, figs. 34*).—A taxonomic study (E. S. R., 85, p. 315), with key to the species.

Una referencia a todas las especies de *Coffea* conocidas, su distribución geográfica y su literatura original [A reference to all the known species of *Coffea*, their geographic distribution and the original literature thereon], J. C. T. UPHOF (*Café El Salvador, 11 (1941), No. 129, pp. 604-613*).—Included are 141 species, with bibliography.

New or noteworthy Philippine fungi, III, J. M. MENDOZA and S. LEUS-PALO (*Philippine Jour. Sci., 75 (1941), No. 2, pp. 165-183, figs. 9*).—In this contribution 10 species of *Cercospora* are described as new, and 20 species previously described from extra-Philippine material are for the first time reported from the Archipelago, 10 of these being *Cercosporas* and the rest *Agaricaceae*.

A revision of *Melanconis*, *Pseudovalsa*, *Prosthecium*, and *Titania*, L. E. WEHMEYER (*Ann Arbor: Univ. Mich. Press; London: Oxford Univ. Press, 1941, pp. VIII+161, pls. 11*).—This is a monographic revision of the four related sphaeriaceous genera of *Pyrenomycetes*, with keys to the genera and species based primarily on spore characters and secondarily upon stromatic features and conidial stages. The genera regarded chiefly as artificial conceptions with arbitrary boundaries are subdivided into newly named subgenera and sections considered to be natural groups that "will probably be recognized as genera when our knowledge of natural affinities is more complete." With each specific description including conidial stages is a comprehensive synonymy with references and citations of types and pertinent exsiccati, together with records of cultures by the author. An appendix disposes of the several species hitherto referred to the genera *Calospora*, *Massaria*, and *Aglaospora* rendered invalid or questionable by inclusion of their type species in the four genera monographed. The index is complete with page references to the species and genera considered.

Untersuchungen zur Ökologie der höheren Pilze [Investigations of the ecology of the higher fungi], K. FRIEDRICH (*Jena: Gustav Fischer, 1940, pp. [3]+52+[1], figs. 2*).—This monograph (two pages of references) considers various habitat factors in their influences on fungus growth, fungus surveys and associations, and the fungi of mountainous areas. An index is provided.

Contribución para una interpretación correcta del concepto ecológico [Contribution to a correct interpretation of the ecological concept], J. TRICORNIA (*Rev. Asoc. Ingen. Agrón. [Montevideo], 13 (1941), No. 1, pp. 14-17*).—A general review and discussion of the subject preliminary to the two following papers.

Representación geográfica de los fenómenos periódicos de la vida vegetal [Geographic representation of periodic phenomena (phenology) in the plant world], J. TISCORNIA (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 13 (1941), No. 2, pp. 20-25, figs. 2; *Eng. abs.*, p. 25).—This paper presents a review of studies by Azzi (*E. S. R.*, 62, p. 314) of the International Institute of Agriculture, Roma, on the establishment of lines similar to isobars and isotherms joining points at which the main growth cycle phases of wheat are developed simultaneously throughout its world zone of distribution. The two most important phenological phases considered are germination and maturity, i. e., the time of sowing (with map showing isophanes) and harvesting the crop. Under conditions of general excess in high or low temperatures the decisive factor in determining the best adapted varieties and the optimum time for sowing is the temperature. On the other hand, with relatively constant temperature the decisive factor is rainfall.

Equivalentes meteorológicos del trigo [Meteorological equivalents for wheat], J. TISCORNIA (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 13 (1941), No. 3, pp. 28-35; *Eng. abs.*, p. 35).—This is a review of studies by G. Azzi (see above) on meteorological equivalents, i. e., values referring to temperature, rainfall, and other climatic factors which are either optimum or limiting (by excess or deficiency) for the different growth cycle phases of crop plants, with particular regard to wheat.

Symbiosis of leguminous plants and nodule bacteria.—I, Observations on respiration and on the extent of utilization of host carbohydrates by the nodule bacteria, G. BOND (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 18, pp. 313-337, fig. 1).—In general, the respiration per unit dry weight of tissue in the nodules of soybeans was found to be about three times that of the roots. At a stage shortly before flowering, the nodular respiration was 25 percent that of the plant as a whole, the roots accounting for 18 and the top for 57 percent. It is assumed that these figures indicate also the respective consumption of carbohydrate for respiratory purposes in the various parts of the plant. Carbohydrate consumption within the nodules of a plant amounted to 16 percent of the total synthesized by the host during the period from shortly before flowering to early fruit formation. For each milligram of N fixed during this period there appeared to have been a consumption of about 19 mg. of carbohydrate within the nodules. The evidence advanced suggests that the bacteria probably accounted for around three-fourths of the respiration of the plant as a whole. The accuracy of these conclusions depends especially on the extent to which the rate of CO₂ formation is a satisfactory basis for comparing the carbohydrate utilization in the katabolism of different biological material. Other possible sources of error are discussed. There are 26 references.

Assimilation des Stickstoffes der Knöllchen durch die Leguminosen [Assimilation of the nitrogen of the root nodules by legumes], M. ALI SADE (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 29 (1940), No. 2, pp. 129-131).

Competition between related strains of nodule bacteria and its influence on infection of the legume host, H. NICOL and H. G. THORNTON (*Roy. Soc. [London]*, *Proc.*, Ser. B, 130 (1941), No. 858, pp. 32-59, figs. 6).—The effects of dominance in competition outside the root system appeared to be of paramount importance in determining which of two *Rhizobium* strains will contribute most to the production of nodules when both are present in the surroundings of their host root system. It thus becomes of practical importance in preparing cultures for commercial distribution to choose strains that not only can produce nodules beneficial to their host but are also dominant in competition with other strains. The intense competition between closely related strains of bacteria may well have a wider importance in its application to pathogenic organisms.

The adaptive enzymes of certain strains of yeasts, H. E. RHOADES. (U. S. D. A.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 99-115, pls. 4).—Nine strains of three species of *Saccharomyces* and one of *Schizosaccharomyces* were studied with regard to the constitutive or adaptive nature of their enzymes toward the fermentation of glucose, mannose, galactose, sucrose, maltose, raffinose, α -methylglucoside, and trehalose.

The carboxylase-cocarboxylase system of Fusaria, A. A. TYTELL and B. S. GOULD (*Jour. Bact.*, 42 (1941), No. 4, pp. 513-526, figs. 2).

Amide synthesis in plants.—I, The succinoxidase system in plants, M. DAMODARAN and T. R. VENKATESAN (*Indian Acad. Sci. Proc.*, 13 (1941), No. 6, Sect. B, pp. 345-359), figs. 8).—The presence of succinic dehydrogenase and oxidase was demonstrated in young seedlings and pods of various legumes, though not detected in leaves and shoots of mature plants of the same species or in seedlings of certain other species. A highly active preparation of the enzyme was made from seedlings of gram (*Phaseolus mungo*), and detailed study indicated its properties and behavior to be in all respects analogous to those for muscle succinoxidase. The presence of the enzyme in seedlings and pods of legumes where asparagine formation is known to predominate lends support to the view that succinic acid is a precursor of asparagine in plants.

The effect of thiamine (vitamin B₁) on fermentation of yeast, H. LASER (*Biochem. Jour.*, 35 (1941), No. 4, pp. 488-494, figs. 6).—Not every type of yeast responded with increased fermentation to added thiamin. Thus bakers' yeast reacted regularly, where *Torula utilis* failed to respond at all. Some yeasts reacted immediately after adding the thiamin, and some only after several hours' incubation. Once the rise of fermentation had started it increased with time for the same thiamin dosage. Differences in increased fermentation from different amounts of thiamin acting on the same amount of yeast are therefore more pronounced after some incubation, though the relative increases remain the same. In yeasts reacting by increased anaerobic fermentation, aerobic fermentation was also increased by the same minute amounts of thiamin, the percentage increase being of about the same magnitude as that of anaerobic fermentation. The reaction causing the increased fermentation has a low temperature coefficient. Different amounts of a slowly reacting yeast sample incubated with the same amount of thiamin for 24 hr. showed, as time went on, a relatively greater increase of fermentation with decreasing amounts of yeast. Reduction of thiamin by H₂ in presence of platinum black yielded an irreversibly inactive product. The Na₂S₂O₄-reduced thiamin, when added to yeast in N₂, affected fermentation in the same way as the oxidized form. It is concluded that the reduction of Na₂S₂O₄ is reversible, and that thiamin reduced by it is reoxidized within the living cell.

Morphological and physiological modifications induced in cells by vitamin B₁, M. N. MEISSEL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 2, pp. 125-128, figs. 2).—It is concluded that organisms needing an external supply of vitamin B₁ (the one-celled *Endomyces magnusii* used) for their development respond to additions of this vitamin to their media not only by accelerated growth and multiplication but also by changes in the structure of their cells and the character of their metabolism. With this vitamin available, the cells underwent morphological and physiological reconstruction and approached the type of cells with anaerobic (fermentative) habit, becoming heavily stored with glycogen and volutine and with chondriome apparatus of sharply different structure. Vitamin B₁ increased the viability of the cells and appeared to protect them from harmful external influences.

Bacterial treatment of seeds as a means of controlling the synthesis of vitamins C and B₁ in the seedlings, A. A. ISSAKOVA (*Compt. Rend. (Dok.)*

Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 2, pp. 170-173).—Treatment of barley and wheat seed with certain bacteria and fungi is reported to have increased in some cases and to have decreased in others the synthesis of these vitamins in the resulting seedlings.

Metabolism of ascorbic acid in cowpea plants, M. E. REID. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club, 68 (1941), No. 6, pp. 359-371, figs. 18*).—Ability to increase the total ascorbic acid (determined by indophenol reduction) during darkness continued as long as the stored reserves in the cotyledons remained available. After this the capacity to use carbohydrates in vitamin synthesis was lacking, or if the conversion occurred the rate was so slow that the metabolic loss masked the synthesis. The loss was accompanied by growth, suggesting that the ascorbic acid may be destroyed in respiration or used in some special type of synthesis. The possibility is discussed that the net loss or gain may not represent the magnitude of ascorbic acid synthesis or loss. Evidence is presented indicating that the net magnitude of the diurnal fluctuations in ascorbic acid can be shown only by measurements of absolute amounts in individual organs or in the entire plant. It is suggested that ascorbic acid synthesis during the dependent phase of growth is effected by the reconstitution of a closely related precursor stored in the seed during its development. An influence of the plumule or radicle is unnecessary to effect synthesis of ascorbic acid in the cotyledons. The ability of crushed cotyledons to synthesize the vitamin appears to depend on the size of the particles.

Rooting and growth of leafy stem cuttings stimulated by heteroauxine, L. F. PRAVDIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 7, pp. 494-496*).—Tests on over 20 ornamental plants grouped them into those whose cuttings were stimulated to root formation by heteroauxin, those indifferent to treatment, and those which failed to root whether treated or not.

Influencing plant development with leaf extracts and other organic substances, C. G. VINSON, A. D. HIBBARD, and R. RODNEY. (Univ. Mo.). (*Com. Fert., 62 (1941), No. 5, p. 28*).—An abstract.

Effect of some organic acid salts on storage of citric acid by leaves of tobacco plants, M. P. PIATNITSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 1, pp. 55-58*).—The citric acid content was found to increase in response to mineral salts and water. It is concluded that keeping the leaves in salt solutions or water before curing leads to the mobilization of greater amounts of available malic acid than with curing alone, this acid being the source of the citric acid.

Effect of mineral salts on storage of citric acids by leaves of *Nicotiana rustica* and *Nicotiana glauca*, M. P. PIATNITSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 1, pp. 59-61*).—It is suggested that the observed stimulating effect of water and mineral salts on the storage of citric acid may perhaps become of commercial use as a new method of treating the raw leaves for increasing their citric acid content.

Leaf albumins as an index for salt resistance of cotton plants, B. P. STROGONOV and L. OSTAPENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 1, pp. 66-68, fig. 1*).—In the tests reported the protein in the plant tissues increased with the concentration of salts in the soil, as did also the plants' resistance to the salts.

[Symposium papers on botany] (In *Cold Spring Harbor Symposia on Quantitative Biology, VIII. Cold Spring Harbor, N. Y.: Biol. Lab., 1940, vol. 8, pp. 51-62, 102-109, 171-215, figs. [241]*).—The following papers, with discussions, are of interest to botany: Some Models of Protoplasmic Surfaces, by W. J. V. Osterhout (pp. 51-62); Plasma-Membrane Structure in the Light of Frost-Hardening

Changes, by G. W. Scarth, J. Levitt, and D. Siminovitch (pp. 102-109); The Intake of Radioactive Isotopes by Living Cells, by S. C. Brooks (pp. 171-180); Salt Accumulation by Plant Cells, With Special Reference to Metabolism and Experiments on Barley Roots, by D. R. Hoagland (pp. 181-194); The Binding of Ions by the Cell Surface, by D. Mazia (pp. 195-203); and The Relations of Bioelectric Phenomena to Ionic Permeability and to Metabolism in Large Plant Cells, by L. R. Blinks (pp. 204-215).

Physiological studies in plant nutrition.—XI, The effect on growth of rubidium with low potassium supply, and modification of this effect by other nutrients—pt. 1, The effect on total dry weight, F. J. RICHARDS (*Ann. Bot. [London], n. ser., 5 (1941), No. 18, pp. 263-296, figs. 8*).—The studies reported are believed to indicate that whereas barley may grow successfully in a high K nutrient solution containing NH_4 salts, only a minimum of Ca, and without Na, it is in such circumstances much more sensitive to K deficiency than usual with other types of solutions. With very low K levels growth very soon nearly ceased, but with Rb added early growth proceeded almost normally. When the Rb level was high, characteristic abnormalities soon appeared with premature death often following, but a range of Rb concentrations exists over which the element increases total growth many times. Na, Li, and Cs did not have this effect. The effect of Rb on growth depends in a complex manner on the Ca- NH_4 status and the P level of the solution, and the main study here concerned the more thorough investigation of this interaction. On the assumption that excessive accumulation of P within the plant is injurious, the effect of Rb on the uptake of that element may account for the results, which are discussed in detail. Reduction in the P content following Rb application to high Ca-high P treatments led to improved growth and general condition. In treatments with low P supply, where growth was already restricted from this cause, Rb addition was followed by further reduction in growth and accentuation of P deficiency symptoms. Though lowering the P level of the high NH_4 treatment at low K levels reduced the toxicity of the treatment, it appears likely that the severe injury under these conditions was partly due to the NH_4 ion, i. e., to internal accumulation of both P and NH_4 . Both these deleterious accumulations are countered by Rb, hence the strikingly beneficial effect of this element. There are 25 references.

Calcium and phosphorus as they influence manganese in forage crops, W. A. ALBRECHT and N. C. SMITH. (Mo. Expt. Sta.). (*Bul. Torrey Bot. Club, 68 (1941), No. 6, pp. 372-380, figs. 5*).—The Mn concentration within the crop and the totals taken by it from the soil point to a dual role of calcium carbonate in relation to this trace element in plant nutrition. When calcium carbonate was mixed throughout the soil so as to modify its reaction, the concentration and total Mn in the crops were decreased as the application to the soil and consumption of Ca by the crop increased. However, when the application was placed in the surface soil to increase crop consumption of the Ca even more, the reverse effect on Mn was manifested. When phosphate was applied to provide increasing concentrations, whether in the entire or limited soil volume, the additional P for the crop gave increasing Mn harvest, roughly parallel with the increased crop growth. Combinations of lime and phosphate in the limited soil areas aided the crop in taking more Mn. This work emphasizes the need to consider the beneficial nutritional role of Ca within the plant, on such soils as the Putnam silt loam used, in making Mn available for the plant as reflected in the increased concentrations. There is need also to consider the possible detrimental role of calcium carbonate as it modifies

the soil reaction or other soil conditions and reduces the Mn taken by the crop, possibly to the danger point of Mn deficiency.

The comparative boron content of potato leaves and tubers produced under different cultural conditions, R. B. CARSON, W. E. TOTTINGHAM, and R. MACVICAR. (Univ. Wis.). (*Com. Fert.*, 62 (1941), No. 5, pp. 28-29).—An abstract.

Effects of boron on germination of pollen and growth of pollen tubes in tomato (*Lycopersicum esculentum* Mill.), I. V. VASSILIEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 6, pp. 532-534).—Boron promoted pollen germination and tube growth when added in the form of boric acid or borax, the best medium tried being a 15 percent sugar solution plus 0.003 percent boric acid.

The germination of maize pollen, R. A. BAIR and W. E. LOOMIS. (Iowa State Col.). (*Science*, 94 (1941), No. 2433, pp. 168-169, fig. 1).—The method developed gave as much as 90 percent germination within 30 min. after inoculation, using a solution containing 0.7 percent agar and 15 percent sucrose held at 60° C. in a water bath and transferred with a pipette to a microscope slide for the test. A major factor for success is the degree of imbedding of the pollen grains in the still-soft agar (the agar percentage, temperature, and cooling rate are important in this connection), best results being obtained when the grains are two-thirds imbedded. Most consistent results also followed use of pollen taken from cut tassels stored overnight to several days at constant temperature and humidity, perhaps because more uniform osmotic values are attained by such preliminary treatment.

Silver nitrate as a stain for use in studies of conduction of liquids in wood, J. W. JOHNSON. (Ohio State Univ.). (*Phytopathology*, 31 (1941), No. 11, pp. 1035-1039, figs. 2).—A silver nitrate solution (2.5 percent in 20 percent ethyl alcohol) was injected into small blocks of green *Pinus ponderosa* sapwood scarred by the California flathead borer *Melanophila californica* larvae. The blocks were then split longitudinally and developed like photographic films, the pattern of precipitated silver on the split surfaces indicating the course of stain movement in the plane of splitting. This method prevents obscuring of the initial pattern by later diffusion of the stain.

Über eine Methode zum Studium der Filtration des Wassers durch den Stengel der Getreidepflanzen [A method of studying the conduction of water through the stem of cereal plants], A. E. WOTSCHAL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 1, pp. 73-75, figs. 2).—The author describes and illustrates an apparatus and procedure for measuring the conductivity of water through stalks of the small grains.

Methods for continuous estimation of the rate of transpiration in plants, A. E. WOTSCHAL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 5-6, pp. 422-424, figs. 3).

The vapor pressure gradient above a transpiring leaf, V. L. FRAMPTON and K. LONGRÉE. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 11, pp. 1040-1042, fig. 1).—The vapor pressure gradient above a leaf transpiring under controlled conditions was found to follow the general equation for a forced diffusion.

The growth of isolated cotyledons of *Cucurbita pepo*, R. BROWN (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 18, pp. 175-192, figs. 4).—Using a quantitative method described, the rate of cotyledon development was always highest with the highest levels of water availability, and the rate fell with decrease therein. The data indicated that the reaction of the cotyledon differs according to the surface exposed, and this, together with certain anatomical observations, suggests

that the immediate effect of certain treatments is localized in the surface layers and the effect on the whole cotyledon is secondary. Light depressed the development of the inner surface, but only affected the outer when it was covered by the inner seed-coat membrane. Removal of this membrane enhanced development in light when the outer surface was turned upwards. Some of the effects due to removal of the inner seed-coat membrane were only evident after the connection with the cotyledon had been broken. These are therefore deemed to be aftereffects which were established at an earlier phase. Removal of the seed coat occasioned a sharp fall in dry weight, attributed to leaching out of soluble substances. Two phases in the development of the cotyledon are distinguished, viz, an early phase, extending over about 48 hr., in which water absorption is by imbibition; and a later phase in which absorption is by osmosis.

Natural conditions reproduced in a chamber for studying gas metabolism in plants, A. E. VOTCHAL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 7, pp. 500-503, figs. 4*).

Responses of some plants to equal and unequal ratios of light and darkness in cycles ranging from 1 hour to 72 hours, H. A. ALLARD and W. W. GARDNER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 6, pp. 305-330, figs. 10*).—In this study Peking soybean, *Zinnia angustifolia*, wheat, and dill were the test plants, and artificial light alone was used, furnished by a water-jacketed, water-cooled 110-v., 1,000-w. incandescent bulb equipped with reflector, giving about 1,200 footcandles at a distance of 1 ft. The ratios of light to darkness were 1:3; 1:2; 1:1.4; 1:1; 1.4:1; 2:1; and 3:1. Continuous illumination was also employed. The ratio of 1:1, affording 12 hr. of light and 12 of darkness, represented the normal cycle or check. The cycles of total light and darkness varied from 1 to 72 hr. in length, and temperatures were maintained at approximately 77° F., with a relative humidity of about 60 percent in all tests. In most cases, the same ratios of light to darkness did not give the same behavior for any particular plant species. With Peking soybean (short-day plant), increase in the light interval of any given cycle resulted in increased growth and yield of dry matter, but the blooming time depended on both ratio of light to darkness and length of cycle. In *Zinnia* (indeterminate plant), flowering time was not particularly affected, but type of growth, amount of dry matter, and greenness of leafage were materially affected. Dill (long-day plant) was affected in flowering time and in all growth features. It was found that increase in growth and dry matter may accompany two contrasting conditions of light relations. In the one, the dry matter increased with increase in the total amount of light, as where unequal ratios of light and darkness obtained in the same cycle. In the other, increase in length of cycle with maintenance of equal ratios of light and darkness resulted in an increase of dry matter, even though the total amount of light received did not change.

Influence of daylength on stem growth in transverse direction, G. M. PSAREV (*Compt. Rend. [Dok.] Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 6, pp. 537-539, fig. 1*).—In general, soybean stems increased in length with increase in day length and transversely as the day length grew shorter. Microscopical examination showed the stem swellings due to the more vigorous growth of the xylem.

Effect of daylength on cambial growth, G. M. PSAREV and N. F. NEUMAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 7, pp. 497-499, figs. 3*).—In soybean the activity of the cambium and the xylem development were stronger with short than with long days, but the two varieties tested varied in their sensitivity to photoperiod.

Frost-resistance of citrus plants as controlled by daylength, S. M. IVANOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 8, pp. 736-738*).—That short periods of light increase frost resistance in woody plants and that frost resistance is connected with an earlier completion of the growth period, which in turn is controlled by day length, are well-known facts. As to the mechanism of frost resistance changes in response to day length, the author found that not only was the resistance of young shoots liable to such change, but that the full-formed new twigs and even the stem varied in resistance according to the same factors. This is interpreted to mean that the early lignification induced by short days cannot alone be responsible for the increased frost resistance observed. From the data presented, it appeared obvious that not only was the active growth of the shoots completed sooner, but the functional activity of the cells connected with growth decreased after active growth and lignification had ended. Comparing frost resistance with glutathione content, it was noted that it increased with the reduction in glutathione due to decreased day length. The sugar content in the leaves was also markedly affected by day length variations, but no definite relation to frost resistance was observed here.

Inhibiting action of blue light upon germination of tomato seeds, N. A. ANELI (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 3, pp. 267-269*).—Under the influence of blue light the biochemical processes underwent an essential change such as to cause delayed germination. The catalase activity, respiration rate, and fat consumption were notably depressed, whereas the syntheses of disaccharides and in part of starch were heightened. After stopping the irradiation, all seeds then held in darkness for 5-7 days germinated vigorously and were only slightly inferior to the control untreated seeds.

The cytoplasm of the plant cell, A. GUILLIERMOND, trans. by L. R. ATKINSON (*Waltham, Mass.: Chronica Botanica Co., 1941, pp. [10]+247, figs. 152*).—During the past two decades when the majority of cytologists were concerned primarily with chromosomes and genes, much research has been done, particularly in France, on plastids, chondriosomes, microsomes, vacuoles, etc., and the author and others have added greatly to our knowledge of such intracellular elements. This volume comprises a critical review of present knowledge of the cytoplasm and of its morphological constituents. As stated by William Seifriz in the foreword, "One cannot read this book . . . without being profoundly impressed with the thoroughness with which it has been written. No one has yet presented, nor is anyone for a long time likely to present, so complete and authoritative an account of the mitochondria story." He also found the author "as awake to the contributions of the newer cytology as to those of the old." This book is the translation of a new and unpublished French manuscript and not merely an English version of a previous work by the author. A bibliography of about 20 pages, and indexes to authors and to plant and animal names are included.

The proliferation of dandelions from roots, E. NAYLOR. (Univ. Mo.). (*Bul. Torrey Bot. Club, 68 (1941), No. 6, pp. 351-358, figs. 16*).—In moist chambers, proliferating tissue on root cuttings appeared in 2-3 days. The mature root consists largely of phloem parenchyma in which concentric rings of sieve tubes associated with lactiferous ducts are embedded. The new parts originate from the parenchyma of the secondary phloem. Shoots are formed at only the proximal ends of cuttings, and roots only at the distal end or occasionally along the sides.

The main outlines of bacterial classification, R. Y. STANIER and C. B. VAN NIEL (*Jour. Bact., 42 (1941), No. 4, pp. 437-466, figs. 2*).—Following a discussion of the problems involved in the creation of the larger taxonomic units among

the bacteria, an outline is given for what the authors believe to be a more rational approach, and their final arrangement is presented in the form of a key to the divisions, classes, and orders of the kingdom Monera, which is composed of microorganisms without true nuclei, plastids, or sexual reproduction. There are two pages of references.

Antagonistic relations of microorganisms, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Bact. Rev.*, 5 (1941), No. 3, pp. 231-291).—This general review (373 references) takes up the survival of pathogens in soil and water; symbiosis and antibiosis; antagonistic effects of bacteria, of fungi, and of animal forms; chemical nature of the antagonistic substances; and disease control with antagonistic microorganisms.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 42 (1941), No. 1, pp. 133-153).—The following are of botanical interest: Bacterial Metabolism of the C₄-dicarboxylic acids, by L. O. Krampitz, M. F. Utter, and C. H. Werkman (pp. 139-140) (Iowa State Col.); Assimilation of C¹³O₂ by Heterotrophic Bacteria, by H. D. Slade, H. G. Wood, A. Hemingway, A. O. Nier, and C. H. Werkman (p. 140) (Iowa Expt. Sta. and Univ. Minn.); The Compatibility of Spergon and *Rhizobium leguminosarum* on Pea Seeds, by J. C. Burton and L. W. Erdman (pp. 142-143); The Separation of Some Aerobic Mesophilic Cellulose Bacteria, by W. H. Fuller and A. G. Norman (p. 144) (Iowa Sta.); The Biological Treatment of Lagooned Corn-Canning Wastes, by H. M. Tsuchiya and H. O. Halvorson (pp. 144-145) (Univ. Minn.); and The Synthesis of Riboflavin by Bacteria and Its Role in Symbiosis, by R. P. Tittsler and E. O. Whittier (pp. 151-152) (U. S. D. A.).

Studies on the nutritive requirements of bacteria, D. W. WOOLLEY (*Jour. Bact.*, 42 (1941), No. 2, pp. 155-163).—A general discussion.

The production of gluconic acid and 2-ketogluconic acid from glucose by species of Pseudomonas and Phytomonas, L. B. LOCKWOOD, B. TABENKIN, and G. E. WARD. (U. S. D. A.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 51-61).—Using submerged aerated cultures, 16 strains of 10 species of *Pseudomonas* produced 2-ketogluconic acid, the yield being over 80 percent in many cases. One strain of *P. ovalis* produced only gluconic acid. Of 8 species of *Phytomonas* studied, 4 produced gluconic acid in appreciable amounts, but none produced 2-ketogluconic acid.

Physiological characteristics of lactic acid bacteria near the maximum growth temperature.—I, Growth and acid production. II, Studies on respiration, R. M. STERN and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 4, pp. 479-499, 501-512, figs. 11).

Electrophoresis studies on Brucella, T. W. STEARNS and M. H. ROEPKE. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Bact.*, 42 (1941), No. 3, pp. 411-430, figs. 3).

The bacterial corrosion of iron and steel, T. D. BECKWITH. (Univ. Calif.). (*Jour. Amer. Water Works Assoc.*, 33 (1941), No. 1, pp. 147-165, figs. 5).

A direct smear method for counting microscopic particles in fluid suspension, S.-H. WANG (*Jour. Bact.*, 42 (1941), No. 3, pp. 297-319).—The method is adapted to estimating such particles as cells, parasites, or bacteria.

Bacterial morphology as shown by the electron microscope.—II, The bacterial cell-wall in the genus *Bacillus*, S. MUDD, K. POLEVITZKY, T. F. ANDERSON, and L. A. CHAMBERS (*Jour. Bact.*, 42 (1941), No. 2, pp. 251-264, figs. 12).—A continuation of the study previously noted (E. S. R., 85, p. 326).

The cytology of bacteria, I. M. LEWIS (*Bact. Rev.*, 5 (1941), No. 3, pp. 181-230).—This comprehensive review (202 references) covers cell inclusions, the nucleus, reproductive structures, cell division, the cell membrane, and flagella.

GENETICS

Transmission tests of maize mutants induced by ultraviolet radiation, G. F. SPRAGUE. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 292 (1941), pp. 385-407, figs. 6).—Various seed and seedling changes induced by treatment (E. S. R., 77, p. 31) with ultraviolet radiation are described briefly. Among 78 inviable types, the mutant type was recovered in F_2 in 71 cases. In several instances the mutant type appeared in low ratios, a tendency most marked in the segregations for "germless" seeds. In male and female transmission tests made with 24 viable mutant types the transmission rates were not significantly different in 15 cases; in the remaining 9 cases the rates were unequal, and in two instances transmission through the male gametophyte was significantly greater than through the female. Several cases of concomitant mutation or derangement, i. e., two or more induced changes in the same gamete, were shown to be separable in F_2 and hence probably of separate origin. The distribution of sperms within the pollen grain and the high absorption of ultraviolet radiation by the pollen grain and its contents appeared to offer a satisfactory explanation for the observed high rate of concomitant derangement. At least some of the induced changes studied, it is concluded, must have been intra-genic in origin.

Inheritance of susceptibility to infection by *Helminthosporium maydis* race 1 in maize, A. J. ULLSTRUP. (U. S. D. A. and Ind. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 6, pp. 331-334, fig. 1).—"The dent corn inbred line *Pr* is unique in its susceptibility to infection by *H. maydis* race 1. All other corn inbred lines and hybrids, including single crosses involving *Pr*, tested in the greenhouse or observed in the field proved to be highly resistant. The susceptibility of the inbred line *Pr* to infection by *H. maydis* race 1 is inherited as a monogenic recessive. The pair of genes concerned have been designated as *Hm hm*."

The pathogenicity of paired haploid lines of *Ustilago zeae* versus the pathogenicity of numerous mixed haploids, M. F. KEENKAMP and W. J. MARTIN. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 1051-1053).—When single pairs of monosporidial lines of *U. zeae* were inoculated hypodermically into corn seedlings, the degree of infection induced ranged from slight to very heavy. The degree caused by mass inoculum comprising all haploid lines used in the pairs was intermediate between that due to the least and the most virulent pairs. Like results were obtained when measured amounts of inoculum were used in the single pairs and the composite inoculum contained equal proportions of each haploid line. Individual corn seedlings were also inoculated with weakly virulent pairs of haploid lines and 3 and 6 days later with highly virulent pairs. In no case did the presence of the weakly virulent pair prevent growth of the subsequently introduced highly virulent pair, but the virulence of the latter was reduced. No antagonism was observed between these haploid lines when they were grown in paired combinations on potato-dextrose agar.

The effect of genetical factors, seasonal differences and soil variations upon certain characteristics of upland cotton in the Yazoo-Mississippi Delta, J. W. NEELY. (Coop. U. S. D. A.). (*Mississippi Sta. Tech. Bul.* 28 (1940), pp. 44, fig. 1).—Effects of genetic and environmental factors and their interactions upon 15 characteristics of upland cotton were studied in field tests 1935-38 at Stoneville, Miss. The cottons comprised 24 strains recently developed for commercial planting in the Mississippi Valley and pertaining to the Acala, Ambassador, Delfos, Deltapine, Express, Missdel, Rowden, Stoneville, and Washington varieties.

Differences between strains in regard to each characteristic were found significant. Yield and earliness characteristics were affected much less by genetic factors than were lint percentage, staple length, boll size, percentage of 5-lock bolls, seed index, and lint index. The effect of seasonal influences upon each characteristic was highly significant and predominated over effects of genetic factors and soil variations in regard to 12 characteristics. Staple length, percentage of 5-lock bolls, and seed index were affected more by genetic factors than by seasonal conditions. Soil variations influenced each characteristic, particularly lint percentage, boll size, seed index, and earliness. Effects upon yield characteristics and staple length, although significant, were smaller. Environmental factors that increase lint percentage might not always be desirable, for the initial effect is sometimes one of decreasing weight of the seed and may actually mean a decrease in acre yield of lint. Staple length and seed index are affected more by genetic factors than by environmental factors. The size of boll and percentage of 5-lock bolls are affected by both groups of factors. The lint index and lint percentage are affected to about the same extent by genetic factors, but lint index is affected less by the environmental factors. Strain differences in earliness, while highly significant, were relatively small. Effects of seasons, however, were very pronounced, and soil effects were highly significant.

Inheritance of rust reaction in a cross between the flax varieties Buda and J. W. S., H. H. FLOR. (U. S. D. A. and N. Dak. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 7, pp. 369-388, figs. 3).—Using a cross between Buda and J. W. S., two flax varieties with differential reactions to physiologic races of *Melampsora lini*, it became possible by selecting appropriate races to study in the greenhouse the inheritance of rust reaction to races to which both parents were immune; one parent was immune and the other resistant, semiresistant, moderately susceptible, or susceptible; one parent susceptible and the other moderately so; and both parents susceptible. The reaction of each seedling to 2-5 physiologic races was determined by successive inoculations of the terminal bud with each race at 7- to 8-day intervals and picking off the infected leaves when the rust had developed sufficiently to determine its infection type. F_1 proved immune to all races to which either parent was immune, indicating immunity to be dominant. Susceptible genotypes were identified in the F_2 , but those with intermediate infection types required further tests in F_3 . None of the large number of F_2 and F_3 plants tested proved susceptible to both race 4 (to which Buda was susceptible and J. W. S. immune) and race 7 (to which Buda was immune and J. W. S. susceptible). The results are explained by assuming that immunity in Buda to race 7 is conditioned by a pair of dominant factors allelic to the pair of dominant factors conditioning immunity of J. W. S. to race 4. The reaction of Buda and the segregation of the F_3 population indicated Buda to carry an additional pair of factors conditioning resistance, semiresistance, or moderate susceptibility to specific races that are independent of and hypostatic to the immune factors. On this basis, the genotype of Buda would be L^1L^1RR and that of J. W. S. L^1L^1rr . Both L^1 and R factors appeared to operate in conditioning resistance to races to which Buda was resistant. Reductions in degree of susceptibility to races to which Buda was semiresistant or moderately susceptible appeared to be largely attributable to the R factor. The R factor was incompletely dominant, and plants heterozygous for it were distinctly less resistant than were homozygous plants to races producing intermediate infection types.

A genetic study of common bean mosaic under conditions of natural field transmission, B. L. WADE and C. F. ANDRUS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 7, pp. 389-393).—In a cross of Stringless Black Valentine \times U. S. No. 5 Refugee and the reciprocal, the results in F_1 - F_3 indicated that the

resistance of U. S. No. 5 Refugee to common bean mosaic virus is dominant to the tolerance of the Stringless Black Valentine, and that a single factor is responsible for the resistance. There were no significant differences between the cross and its reciprocal, but there was a slight but cumulative deficiency of recessives which reached significance in the total populations from segregating families in F₂.

[Genetic studies by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), pp. 31-32).—Included in the report are progress statements by G. P. Burns on studies with violets on polyploidy, the significance of chromosome number relations in hybridization, the effect of colchicine treatments, hybridization, and the cytology of pollen grains and pollination processes.

A colchicine induced tetraploid cosmos: Some comparisons with its diploid progenitors, E. H. NEWCOMER. (Mich. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 5, pp. 160-164, figs. 2).—An account is presented of a tetraploid cosmos obtained by treating diploid seedlings with colchicine. The new plant was larger in every respect, except height, than its parent, but the increase in size of the various units was not proportional in all instances. In actual cytoplasmic volume of the pollen grains there was little, if any, measurable difference and only a slight increase in chloroplast size of the tetraploid. There was a pronounced increase in the thickness of the tetraploid's pollen cell walls. The most obvious effects of polyploidy were increment in size of flower, petal epidermal cells, stomata, and seeds. Field-grown plants were fully fertile.

A preliminary report on genetic studies on pathogenicity and the nature of saltation in *Venturia inaequalis*, G. W. KEITZ and M. H. LANGFORD. (Univ. Wis.). (*Phytopathology*, 31 (1941), No. 12, p. 1142).

Öogenèse and fertilization in *Pinus lambertiana* and *P. monophylla*, A. W. HAUPT. (Univ. Calif.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 482-498, figs. 26).—This investigation of the cytological features associated with the maturation and fertilization of the egg was conducted with two species of pine in which the interval between pollination and fertilization is almost exactly 1 yr. The presence in the mature egg nucleus of a metaplasmic substance that is absorbed from the cytoplasm and entirely obscures the chromatin was confirmed. The diploid number of chromosomes, each split longitudinally, was observed at the metaphase of the first embryonal mitosis.

Species hybrids in forest trees, E. C. SMITH and C. NICHOLS, JR. (*Jour. Arnold Arboretum*, 22 (1941), No. 3, pp. 443-454).—Supplementing a review of work in the field of forest tree breeding, such as the use of selected sources of seed, observations on chromosome numbers, the occurrence of natural hybridization, pollination technics, etc., the authors present a list of crosses in the genera *Betula*, *Populus*, and *Ulmus* made at Harvard University in the years 1938 and 1939. In the genus *Populus*, *P. maximowiczii* appeared to be a promising species for use as a female parent.

[Papers dealing with speciation in animals] (In *Biological Symposia*, II, edited by J. CATTELL. Lancaster, Pa.: Jacques Cattell Press, 1941, vol. 2, pp. 1-122, figs. [12]).—Included in this symposium on speciation are articles by L. J. Cole (Univ. Wis.), C. L. Hubbs, L. R. Dice, M. R. Irwin, and R. W. Cumley (Wis. Expt. Sta.), S. Wright, E. Mayr, W. P. Spencer, and T. Dobzhansky. These deal with animals, birds, fishes, and insects.

Animal biology, M. F. GUYER (*New York and London: Harper & Bros.*, [1941], 3. ed., pp. XIX+723, figs. 423).—This general account of the evolution of animal forms and types of systems in animal life brings up to date the book previously noted (E. S. R., 78, p. 656).

Progress report on possibilities in progeny-test breeding, H. D. GOODALE (*Science*, 94 (1941), No. 2445, pp. 442-443, fig. 1).—Selection for size in mice has continued through 28 groups, 14 of which have been previously noted (E. S. R., 79, p. 611), and the heaviest ♂s and ♀s at 2 mo. gave respective average weights of 54.3 and 49.7 gm. It is suggested that progeny testing of the kind employed by selection in a desired direction seems to offer unlimited possibilities.

Size inheritance, W. E. CASTLE. (Univ. Calif.). (*Amer. Nat.*, 75 (1941), No. 760, pp. 488-498).—Essentially noted previously (E. S. R., 86, p. 28).

The inheritance of equine coat color, [I], II. (Cornell Univ.). (*Jour. Hered.*, 32 (1941), Nos. 7, pp. 235-240; 8, pp. 255-260, fig. 1).—Two studies are presented.

[I]. *The basic colors and patterns*, G. W. Salisbury.—A study of the basic colors of 7,727 Shetland ponies recorded in the American Shetland Studbook showed that, in general, they were inherited in the same manner as in horses. White manes and tails were caused by recessive genes independent of body color. Gray was produced by a dominant gene epistatic to the other colors. Roaning seemed to react somewhat in the same way but did not obscure basic coloring. White spotting and limited white markings were of several types in these ponies and in Finnish and Thoroughbred horses. The presence of a dominant white is noted.

II. *The dilutes, with special reference to the Palomino*, G. W. Salisbury and J. W. Britton.—The Palomino color in horses appears to result from an incompletely dominant dilution gene superimposed on a basic chestnut or sorrel color. When heterozygous dilutes were backcrossed with solid colored ponies there were produced 131 dilutes to 136 nondilutes. The homozygous dilute chestnut or sorrel was almost devoid of hair pigment, had pink skin and china eyes, and had been termed albino.

Significance of haematological studies in horse breeding, H. F. KUSHNER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 7, pp. 652-654).—The blood value based on hemoglobin content, erythrocyte number, and alkalinity (measured in percentage) was shown to be consistently higher for 2-year-old mares and 3-year-old stallions of the Thoroughbred breed selected for the next year's races than for rejects. Other outstanding performance records of the mares and stallions with high blood values are noted. The hereditary nature of differences in blood composition has been noted by Patrushev (E. S. R., 80, p. 471).

The chromosome complex of domestic sheep (*Ovis aries*), R. O. BERRY. (Tex. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 8, pp. 261-267, figs. 5).—The chromosome numbers of testicular material from Rambouillet rams showed 54 as the diploid number, with 27 in the metaphase plates of the primary spermatocytes. Six V-shaped chromosomes were observed. A heteromorphic pair was considered evidence of the X and Y chromosomes. When an animal has just attained sexual maturity seemed the best time for making cytological preparations.

Report of a case of true lateral hermaphroditism in *Sus*, P. E. NIELSON. (Univ. Wis.). (*Anat. Rec.*, 80 (1941), No. 1, pp. 1-11, pls. 2).—A case of lateral hermaphroditism discovered in the routine inspection of swine at a packing plant is described. There was an ovary on the left side, and a testis on the right. Ovulation had occurred, and a corpus luteum was present. The testis was abdominal and of the cryptorchid type.

The inheritance of paralysed hind legs, scrotal hernia, and atresia ani in pigs, S. BERGE (*Jour. Hered.*, 32 (1941), No. 8, pp. 271-274, figs. 4).—Essentially noted from another source (E. S. R., 85, p. 177).

Wolf-dog genetics, N. A. ILJIN (*Jour. Genet.*, 42 (1941), No. 3, pp. 359-414, pls. 13, figs. 8).—More than 100 of the F₁, F₂, F₃, and F₄ progeny of a zonar-gray, wild-gray wolf ♂ and a black mongrel sheep dog ♀ were examined and showed that the wolf and dog could be readily crossed with segregation for hair and eye color, size, ear form and skull characters, and physiological peculiarities. The many similarities between dogs and wolves suggested the possibility of the origin of the various races of *Canis familiaris* from a single wild species, viz. *C. lupus*.

"Misty," a new coat color dilution in the mouse *Mus musculus*, G. W. WOOLLEY (*Amer. Nat.*, 75 (1941), No. 760, pp. 507-508).—The new coat color was distinct from the multiple allelic albino series and leaden genes since intensely colored individuals were produced in the first generation following this type of crossing. Four types of individuals were produced by backcrossing the F₁ ♀s to dilutes. One of these groups was described as only a slight dilution. This was caused by the recessive gene designated as *m* for misty. Microscopic examination of the hair of *mm* individuals showed the presence of more cortical pigment and less pigment clumping than in *dd* or *lnln* mice. It must be ascertained if *m* is a modifier or the main gene.

The autosexing Ancobar, W. F. LAMOREUX. (Cornell Univ.). (*Jour. Hered.*, 32 (1941), No. 7, pp. 221-226, figs. 3).—Sex dichromatism between birds homozygous and hemizygous for sex-linked barring (*B*) in the presence of the autosomal gene *e'* for mottling made possible the development of the autosexing Ancobar. Of 330 barred and mottled chicks in the F₂ and backcross generations from mating mottled Ancona ♀s with Barred Plymouth Rock ♂s, 93 percent were correctly classified as to sex at hatching. This was possible because of the presence of the two sex-linked barring genes in the ♂s which usually caused a lighter color in the presence of the autosomal mottling gene. Among the chicks with black backs, 98 percent were ♀s, and more than 97 percent of those with light backs were ♂s. The adult plumage in ♀s is barred, but white occurs with only scattered barring in the ♂s.

Hereditary microphthalmia in the domestic fowl, F. P. JEFFREY. (N. J. Expt. Stas.). (*Jour. Hered.*, 32 (1941), No. 9, pp. 310-312, fig. 1).—Hereditary bilateral microphthalmia was recessive to the normal. The gene caused a small eyeball, not visible externally, with thickening of the comb of the chick. Matings of carriers (heterozygotes) produced 196 normals to 60 microphthalmic individuals. Hatching percentages of 25 and 43 of microphthalmic individuals in different years and the helplessness of the chicks at hatching suggested that the condition was a semilethal before hatching and a true lethal after hatching.

Four generations of fowls bred for resistance to neoplasms, F. B. HUTT, R. K. COLE, and J. H. BRUCKNER. (Cornell Univ.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 514-526, fig. 1).—By careful selection of breeding stock, mortality from all causes in pullets between 160 and 500 days of age in a line of White Leghorns bred for resistance to disease was reduced from 64 percent in the original unselected populations to 38 percent in the fourth selected generation. Mortality in a line bred for susceptibility to disease was 61 percent in the fourth generation. Selection was based on freedom of families from lymphomatoses and other neoplasms. Only 12 percent died in the resistant strain as contrasted with 26 percent in the susceptible strain in the fourth selected generation. As the resistance to neoplasms increased by selection, increases in body weight, egg production, and egg weight were also attained in the selected line. The observations were based on about 1,000 pullets housed in each of 5 yr. The mean age at death of the pullets in the resistant strain increased for the first 4 yr., although there was some decline in the fifth year.

because of some question of the reliability of natural exposure, half of the chicks of some 1939 hatches were inoculated intraperitoneally with 0.5 cc. of a suspension of lymphomatous tissue. Mortality from neoplasms in inoculated birds was 23 percent, as compared with 12 percent in naturally exposed birds, but the greater amount was considered due to the heavier dose. Striking differences of from 5 to 30 percent in the mortality from neoplasms in families of 11 sires and differences in purebreds and crosses indicate a genetic basis for resistance to neoplasms. The results show possibilities of breeding for disease resistance.

Note on the sex ratio and mortality in turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Amer. Nat.*, 75 (1941), No. 759, pp. 389-393).—Among 19,446 poults and turkey embryos, 50.17 percent were ♂s, but the heavier mortality of the ♂s in hatching reduced this to 49.20 percent in hatched poults. During the last week of incubation, more ♂ than ♀ turkey embryos died, but the reverse was found in chickens. Sex-linked genes seemed to have little or no influence on the sex ratio of the turkeys, whereas they perhaps exert an influence on the secondary sex ratio of some strains of chickens, as noted previously by Byerly and Jull (*E. S. R.*, 73, p. 671).

Observations on the embryonic development of turkeys, L. A. WILHELM and E. I. ROBERTSON. (Wash. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 425-427, figs. 2).—Average weights, lengths, and widths of turkey embryos from the fourth to the twenty-fifth day of incubation showed that at from 7 to 22 days the turkey embryo practically doubles its weight in each successive 3-day period. Length and width increases throughout the incubation period were practically linear and furnished a more accurate measure of development than weight.

Histological observations on the formation of the chalaza in the hen's egg, H. M. SCOTT and W. L. HUANG. (Kans. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 402-405, figs. 2).—Histological study of 21 eggs removed from the oviduct at various stages of development first showed chalazal formation in the small end of the egg. It was first detected in eggs removed from the magnum. The chalazas are formed from a suspension of mucin fibers by rotation of the egg, as noted by Conrad and Phillips (*E. S. R.*, 79, p. 526).

High frequency conductivity and dielectric effect of fresh fertile and infertile hens' eggs, A. L. ROMANOFF and K. FRANK. ([N. Y.] Cornell Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 527-530, fig. 1).—Fresh infertile eggs were found to have a higher conductivity and a tendency toward a lower dielectric constant than fertile eggs. The conductivity of the albumen of fertile eggs was 7.4 percent lower than that of infertile eggs. The apparatus and methods for the precise measurements of small differences in the high frequency conductivity and dielectric effect of the intact egg and portions of the contents are described.

Rheological properties of bovine cervical secretions during the oestrous cycle, G. W. SCOTT BLAIR, S. J. FOLLEY, F. M. V. COPPEN, and F. H. MALPRESS (*Nature [London]*, 147 (1941), No. 3728, pp. 453-454, fig. 1).—This brief report from the National Institute for Research in Dairying describes a simple apparatus (oestroscope) which is employed to measure the flow-elasticity of bovine cervical secretions. Based on the established variation in the consistency of the cervical secretion at different stages in the oestrous cycle, this technic has proved useful in the prediction of oestrus in cows.

The influence of oöphorectomy on the performance of greyhound bitches, J. QUINLAN and H. P. STEYN (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 15 (1940), No. 1-2, pp. 281-291).—Ovariectomy of 12 greyhound bitches between the

ages of 6 and 12 mo. did not interfere with their racing performance as compared with 6 normal litter mates. Some of the bitches increased in weight, but no cases of heat were noted.

Diminution in ability of the liver to inactivate estrone in vitamin B complex deficiency, M. S. and G. R. BISKIND. (Univ. Calif. et al.). (*Science*, 94 (1941), No. 2446, p. 462).—The inactivation by the liver of oestrone in pellets implanted in the spleen of rats (E. S. R., 86, p. 30) was prevented by vitamin B complex-deficient diets. Within 2 weeks on deficient diets, implanted ♀s previously anoestrous on normal diets developed irregular oestrus and after 3 weeks remained in constant or nearly constant oestrus.

The interrelation of oxidative and glycolytic processes as sources of energy for bull spermatozoa, H. A. LARDY and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 133 (1941), No. 3, pp. 602-609, fig. 1).—In further study of the nature of the intracellular substances other than glucose utilized for energy by bull spermatozoa and the relationship between the oxidative and glycolytic processes (E. S. R., 85, p. 468), spermatozoa separated from semen were able to maintain motility in Ringer phosphate solution only in the presence of O₂. There was practically no motility in a N atmosphere, but with glucose solution added motility was maintained as long as 3 hr. in both air and N atmospheres. Only sugars which spermatozoa could catabolize to lactic acid were effective in maintaining motility. Chemical analyses of semen stored with different sugar solutions showed the phospholipide content of the semen to decrease in proportion to the oxidative utilization of intracellular reserves for motility. Thus phospholipides seem to be the source of reserve energy obtained by oxidative processes from glycolysis of glucose or other glycolyzable sugars.

Problems of artificial insemination in horse and mule production, V. R. BERLINER. (Miss. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 770, pp. 384-388, fig. 1).—Essentially noted previously (E. S. R., 84, p. 463).

Artificial insemination of pigeons and doves, R. D. OWEN. (Wis. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 428-431, figs. 3).—The technic of Quinn and Burrows (E. S. R., 75, p. 326) for obtaining semen and carrying out artificial insemination with fowls has been modified and used with pigeons.

FIELD CROPS

[Agronomic research in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 35-37, 39-42, 45-47, 48-50, 54-57, 93-100, 101-106, 156-157, 158-160, 161, 196).—Papers of interest to agronomists, presented at the convention of the Association of Southern Agricultural Workers at Atlanta, Ga., February 5-7, 1941, and reported largely in abstract form, included Agronomic Measurements for Evaluating Results of Pasture Experiments, by O. S. Aamodt (pp. 35-36), Production and Harvesting Machinery of Sweet Potatoes for Starch Manufacture, by J. W. Randolph (p. 160), and The Preservation of Sweet Potatoes for Industrial Utilization, by F. H. Thurber (p. 161) (all U. S. D. A.); Do the Amounts of Replaceable Potassium in Alabama Soils Reveal the Need for Potassium When Cotton Is the Crop Grown? by N. J. Volk (pp. 55-56), Difference in Response of Six Different Crops to "Minor" Element and Magnesium Fertilization, by A. L. Sommer and A. Baxter (p. 94), and Nitrogen Losses from Legumes on Three Major Soil Types in Alabama as Revealed by Lysimeter Studies, by R. J. Jones (pp. 105-106) (all Ala. Expt. Sta.); The Pasture Cafeteria as a Means of Evaluating New Pasture Plants, by G. E. Ritchey (pp. 40-41), and Alyce Clover—A New Hay and Pasture Crop for the Southeast, by R. E. Blaser and G. E. Ritchey (p. 99) (both Fla. Sta. and U. S. D. A.); Data on Some Pasture

Research Techniques, by O. E. Sell (pp. 39-40), Soil Acidity and the Available Nutrients in Some Soils of Georgia, by L. C. Olson (p. 93), The Use of Gypsum in Fertilizers for Cotton, by E. D. Matthews (p. 95), and Peanut Fertilizer Studies in Georgia, by U. R. Gore (pp. 103-104) (all Ga. Sta.); Breeding Southern Grasses for Disease Resistance, by G. W. Burton (pp. 49-50) (Ga. Coastal Plain Expt. Sta. and U. S. D. A.); Using Livestock to Measure Results of Pasture Experiment, by W. P. Garrigus (pp. 36-37), and The Amount of Available Nitrogen Under Burley Tobacco and Its Effect on Yield and Quality of the Crop, by P. E. Karraker and C. E. Bortner (pp. 98-99) (both Ky. Sta.); The Response of Southern Grasses and Legumes to Environmental Factors as Expressed by the Chart Quadrat Method of Studying, by J. P. Gray (pp. 99-100), and Breeding Sweet Potatoes for Table Stock and for Starch, by J. C. Miller (pp. 158-159) (both La. State Univ.); Problems Specific to the Production of Sweet Potatoes for the Starch, by W. S. Anderson (pp. 159-160), and Effect of Storage of Treated Cotton Seed in Closely-Woven Cotton Bags, by L. E. Miles (p. 196) (both Miss. Sta.); Some Effects of Fertilization on the Botanical and Chemical Composition of Pastures, by W. W. Woodhouse, Jr. (pp. 41-42), Correlation of Soil and Tissue Tests as an Index of Nutrient Levels for Peanut Production, by E. R. Collins, L. Burkhardt, and H. D. Morris (pp. 54-55), The Boron Status of North Carolina Soils and Crops, by J. R. Piland (p. 95), The Effect of Different Cropping and Cultural Treatments on Some Physical Properties of Cecil Soil, by J. F. Lutz (p. 96), Preliminary Results of the Utilization of Corn Belt Inbreds in the N. C. Corn Breeding Program, by P. H. Harvey (pp. 96-97), Agronomic Farm Practices in the Tobacco Belt of North Carolina, by J. F. Lutz (pp. 97-98), Response of Peanut Varieties to Different Fertility Levels, by G. K. Middleton and J. W. Farrior (pp. 101-102), The Improvement of Virginia Type Peanuts by Mass Selection, by J. W. Farrior and G. K. Middleton (p. 102), and Studies in Field Plot Technique for Peanuts, by P. H. Harvey and H. F. Robinson (p. 103) (all N. C. Sta.); Measuring Pastures with Dairy Cattle, by J. P. LaMaster (p. 37), Response of Cotton Grown at Different pH Levels on Cecil Sandy Loam, by W. R. Paden (pp. 93-94), Cotton and Corn Response to Potash in South Carolina, by G. B. Killinger (p. 104), and Problems Specific to the Production of Sweet Potatoes for Commercial Shipment, by O. B. Garrison (pp. 156-157) (all S. C. Sta.); Virginia Pasture Investigations, by A. D. Pratt (pp. 45-47), and Time and Rate of Plant Nutrient Absorption by Bright Tobacco, by A. L. Grizzard and L. Kangas (pp. 56-57) (both Va. Sta.); and Progress in Pasture Improvement Methods, by R. H. Lush (pp. 48-49).

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, pp. 1, 2, 7, 8).—Progress results from current agronomic research are reported in articles entitled: Six-Weeks Cowpeas Fruit Well in Old Test and in '41 Holly Springs Test, by E. B. Ferris; Methods Outlined for Harvesting Dallis Grass Seed, by H. W. Bennett; Dolomite Gives Best Returns for Cotton and Vetch, by C. D. Hoover; and Sources, Rate, and Date of Applying Nitrogen to Oats, by R. Kuykendall.

[Field crops and pasture research in New Hampshire] (*New Hampshire Sta. Bul.* 330 (1941), pp. 18, 21-24, 25-26, 28, 38).—Current results are again reported (E. S. R., 83, p. 760) from agronomic research by M. F. Abell, F. S. Prince, P. T. Blood, L. J. Higgins, T. G. Phillips, G. P. Percival, P. N. Scripture, B. G. Sanborn, S. Dunn, and C. L. Calahan, including fertilizer tests with alfalfa on neglected hay lands; a dairy farm rotation with sweet corn as cash crop; rotation and fertilizer tests with potatoes; a fertilizer experiment with clover-timothy hay in the Connecticut Valley; pasture improvement by brush removal and fertilization; a study of pasture grasses and legumes pure and in

mixtures; improvement of timothy and red and white clovers; variety tests with corn and alfalfa; the effects of soil moisture and fertilizer placement on the vitality of the potato seed piece; and poison ivy control.

[**Field crops work of the Puerto Rico University Station**] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 64-67, 84-94, 97-104, 105-106, 122-128, figs. 3*).—In addition to results of research with field crops during the biennium noted from other sources (E. S. R., 83, p. 617; 86, p. 34), data are reported by J. P. Rodríguez, P. Richardson, A. Roque, L. A. Serrano, F. Chardón, F. Méndez, C. A. Clavell, E. Molinary Salés, G. Lebedeff, F. J. Juliá, A. R. López, J. H. Axtmayer, J. A. Goyco, and M. C. Fernández, on variety tests of cotton, sugarcane, and soybeans; corn hybrids; fertilizer tests with sugarcane, corn, and cassava; and the comparative forage production of soybeans, pigeonpeas, cowpeas, mung beans, and alfalfa.

[**Studies in range and pasture botany**, W. E. LAWRENCE (*Corvallis, Oreg.: OSC Coop. Assoc., [1940], pp. [184]*).—The general field of range and pasture botany is covered in a number of studies dealing with the range problem, life histories of forage plants, plant regions and groups, grazing areas, plant-soil-grazing relations, and poisonous species. A list of manuals and floras for the United States and Canada, an index to common and scientific names of plants, and a chapter on the preparation of scientific papers are appended.

[**Pastures and meadows in Vermont**] (*Vermont Sta. Bul. 475 (1941), pp. 21-22*).—Pasture management studies and experiments by A. R. Midgeley on the maintenance of permanent hay lands, both involving zigzag clover and birdsfoot trefoil and other forage species and fertilizer treatments, are reported on briefly.

[**Grass** (*North Dakota Sta. Bul. 300 (1941), pp. 112, figs. 41*).—A memorial to J. H. Shepperd (E. S. R., 80, p. 719), this summation of present knowledge about grass in North Dakota comprises a number of contributions by grassland researchers including the introduction, by W. Whitman (pp. 4-9); sections on Introduced and Cultivated Grasses (pp. 21-31), and Native Grasses (pp. 32-62), both by Whitman and O. A. Stevens; and Characteristics of Grasses (pp. 17-21), Weedy Grasses (pp. 62-65), and Catalog of North Dakota Grasses (pp. 98-107), all by Stevens. Articles prepared in cooperation with the U. S. Department of Agriculture include Value of North Dakota Grasses for Grazing (E. S. R., 81, p. 91), by J. T. Sarvis (pp. 9-16); Grass Culture, by L. Moomaw (pp. 65-76); Processing Grass Seed (E. S. R., 82, p. 181), by G. L. Weber (pp. 76-82); Grass in the Crop Rotation, by J. C. Thysell (pp. 82-88); Diseases of Grasses in North Dakota, by R. Sprague (pp. 88-93); and Grass Breeding and Improvement, by G. A. Rogler (pp. 93-98). An index is appended.

[**Comparative water usage and depth of rooting of some species of grass**, N. L. PARTRIDGE. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 426-432*).—The water usage by 10 common grasses, May 3 to September 29, and the development and distribution of roots were studied in 3-gal. containers. The grass provided an effective mulching material which reduced greatly the amount of water evaporated directly from the soil surface. Considerable differences were noted in the proportionate distribution of roots in depth as well as in the total weight produced. The use of smooth brome grass, quack grass, and reed canary grass did not seem advisable in orchards, since they transpire large quantities of available water and their roots penetrate deeply enough to reach moisture reserves not so likely to be reached by the other species. Redtop, Kentucky bluegrass, and the fescues also transpire considerable available water but do not penetrate so deeply. Timothy and Canada bluegrass seem to offer less competition to trees, but may not always prove most effective for neither is adapted to all soil conditions found in orchards.

The effect of adding vitamin B₁ (thiamin) to several grass species, G. H. AHLGREN. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 572-576, fig. 1).—Additions of 0.01 mg. per liter of vitamin B₁ had no effect on dry matter accumulation of tops and roots of *Poa pratensis* grown in sand from seed under conditions of either medium or a low nitrate concentration in nutrient media, or of *P. trivialis* and *Agrostis tenuis* grown from cuttings and receiving a nutrient solution containing a medium nitrate concentration.

The distribution of Canada bluegrass and Kentucky bluegrass as related to some ecological factors, J. M. WATKINS, G. W. CONREY, and M. W. EVANS. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 9, pp. 726-728).—Observations of soils under two sod types suggested that Kentucky bluegrass inhabited the darker and more friable soil. That the average percentage of organic matter was 2.1 under Kentucky bluegrass and 1.3 under Canada bluegrass was shown by analyses of soil from roadway cuts. The pH values in general were higher under the Kentucky bluegrass sods in pastures. Canada bluegrass was often found growing in dense stands under maple trees along the highway, whereas Kentucky bluegrass dominated away from the trees. On broadcast plats of each species, average yields of plant parts of Kentucky bluegrass slightly exceeded those from Canada bluegrass on a dry weight basis, and its rhizomes penetrated deeper. See also an earlier note by H. B. Hartwig (*E. S. R.*, 80, p. 763).

Seed production of smooth brome grass as influenced by applications of nitrogen, C. M. HARRISON and W. N. CRAWFORD. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 643-651, fig. 1).—Smooth brome grass (*Bromus inermis*) planted in 28-in. rows was fertilized with ammonium sulfate at acre rates varying from 100 to 1,000 lb. in three spring months. N applied in April and May of the first seed year (1938) resulted in seed yields greater than the controls, but the same applications in June did not consistently stimulate seed yields. In the second seed year (1939), April applications resulted in marked increases in seed yield, May treatments were not as effective, and June treatments were only slightly better than the control. Lodging was evident with the highest N rates in June 1938, and in April and May 1939. Forage production was stimulated most by the N in May in 1938 and by April applications in 1939. The number of fertile tillers and spikelets per panicle were slightly influenced by N applications, whereas the number of barren tillers and florets per spikelet were significantly increased. The protein content of the forage at seed harvesttime rose consistently with the N rate, June being the most effective date in 1938 and April in 1939.

Pasture investigations.—IX, Ladino clover experiments, 1930 to 1940, B. A. BROWN and R. I. MUNSELL ([*Connecticut*] *Storrs Sta. Bul.* 235 (1941), pp. 42).—The results of 11 formal experiments with Ladino clover (*Trifolium repens latum*), concerned in particular with seedings, fertilization, and management, and reported in the ninth contribution in this series (*E. S. R.*, 75, p. 618), proved that it is one of the best legumes for hay and pasture in the region. Experimental yields ranged from about 2,500 to 5,500 lb. of dry matter per acre. It has been less subject to heaving and has yielded more seeded with a grass than when sown alone. Orchard grass was most satisfactory in Ladino mixtures for pasture, and timothy in mixtures chiefly for hay. Inclusion of red clover in orchard grass-Ladino seedings has reduced the prevalence of Ladino and yields of dry matter. Adding Ladino to red clover-timothy mixtures increased the 3-yr. hay yields by about 1 ton per acre. Only 1 or 2 lb. per acre of Ladino seed in mixtures has been enough for good stands.

Ladino has been more tolerant of acid, depleted soils than alfalfa and thrives under conditions suitable for red clover or even where the soil is too wet for that

legume. Indications were that limestone and superphosphate should be used as for red clover seedings. Better stands and larger yields were maintained where generous quantities of K were applied. Growth was not improved by B, Mn, and Cu. Although Ladino clover is also much less sensitive to severe cutting or grazing than alfalfa, it maintained better stands when not cut until 6 or 8 in. high and not closer than 4 in. Close cuttings in October have been harmful, especially to nearly pure stands. Analyses and animal preferences indicated that Ladino has a very high feeding value. Freshly cut Ladino usually contains a higher percentage of moisture than do other legumes.

The effect of rate of planting on yields of adapted and unadapted red clover, E. A. HOLLOWELL and D. HEUSINKVELD. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 569-571).—When Ohio (adapted), and western Oregon and French (unadapted) red clovers were seeded at rates of 5, 10, 15, and 20 lb. per acre in systematic replicated plats for yield determinations 1930-33, inclusive, at Holgate, Ohio, increasing the rates from 10 to 20 lb. per acre did not significantly change relative yields of adapted and unadapted seed, although an increase from 10 to 15 and 20 lb. provided more uniform initial stands.

An examination of the accuracy of lattice and lattice square experiments on corn, W. G. COCHRAN (*Iowa Sta. Res. Bul.* 289 (1941), pp. 397-415).—The results of 93 lattice or lattice square designs used in corn varietal tests, 1938-40, were examined for accuracy. For triple lattice designs, three replications averaged somewhat more accurate than five replications of the type of randomized blocks design used previously. Since part of this increase in accuracy might be attributed to the long and narrow shape of replication in the randomized blocks designs, smaller increases would be expected over a randomized blocks design with a more compact replication. For lattice square designs, the increase in accuracy over randomized blocks represents a saving of about one replication in six with 25 varieties, one in five with 49 or 81 varieties, and one in three with 121 varieties. The average standard error per plat of 20 hills ($\frac{1}{200}$ acre) was about 8.5 percent and did not vary markedly among years. The slight increase of standard error with increasing numbers of varieties in a test indicated the value of these designs in providing accurate comparisons for tests with many varieties.

Although many experiments would be needed for a precise comparison, lattice square designs with 4x5 hill plats appeared no more accurate than lattice designs with 2x10 hill plats, as judged by standard errors per plat. Additional evidence in support of this result was obtained on three corn-uniformity trials wherein a lattice square with 2x10 hill plats gave a 15 percent gain in accuracy over either a triple lattice with 2x10 hill plats or a lattice square with 4x5 hill plats. This latter result suggested that lattice square designs may be used profitably in corn experiments with 2x10 hill plats and may also be serviceable for crops, such as small grains and soybeans, where the plat is long and narrow.

The effect of root pruning and the prevention of fruiting on the growth of roots and stalks of maize, J. T. SPENCER. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 481-489, figs. 6).—Effects of root pruning, prevention of fruiting, and their combination upon subsequent growth were studied in 7 inbred lines of corn and 21 possible single crosses among them. Roots of both inbreds and hybrids showed marked reductions in pulling resistance at maturity as a result of pruning, and on the hybrids there were decreased weight of main roots and increased weight of lateral roots. After prevention of fruiting, roots of hybrids increased 48 percent in total dry weight

and 25 percent in pulling resistance compared with untreated plants. The combination treatment likewise resulted in increases in these characters. Responses to treatments consisted largely in increased development of lateral root, averaging for root pruning 28 percent, prevention of fruiting 82, and their combination 130 percent. Root pruning resulted in reductions of 18 percent in grain weight and 14 percent in stover weight, and also reduced the grain-stover ratio of four of the seven groups of hybrids.

The composition of the corn plant grown under field conditions in relation to the soil and its treatment, M. E. WEEKS, E. N. FERGUS, and P. E. KARBAKER. (Ky. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 140-146).—Three crops of plots, each consisting of a variety and a hybrid, from the variously treated plants of two fields were analyzed for ash constituents, N, ether extract, and crude fiber. Manure, limestone, and fertilizer treatment affected considerably the amounts of P, Ca, Mg, K, and, to a lesser extent, N in the grain and stover. The P content of the crop varied directly with the amount supplied to the soil. Where limestone was used together with phosphates, the percentage of P in the crop decreased and Ca generally increased in both grain and stover over plots where phosphates alone were used. The Mg content in corn grown on limed soil was generally higher than in that grown on similar soil not limed. K fertilization apparently had no consistent effect on the K content of the grain, yet it increased the amount of K in the stover on the Berea field but not on the Campbellsville field. On the latter field, the amount of K was higher in stover from checks where yields were low than in that from higher-yielding treated plots. N tended to be higher in grain on plots receiving both limestone and phosphate than from other treatments. Fat and fiber did not seem to be affected consistently by treatments.

Relative growth rate of the main stem of the cotton plant and its relation to yield, N. I. HANCOCK. (Tenn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 590-602, figs. 3).—Plants of upland cotton varieties grown under field conditions at Knoxville, Tenn., were studied, 1931-38. Plant height was found to be associated closely with the potential as well as the actual crop of bolls. Measurement of 4,679 plants during 3 yr. revealed that from 70 to 80 percent of bolls were in the vertical fruiting areas nearest the main stem. Shedding mainly took place horizontally along the fruiting limb. The curve representing growth rate of the plant was sigmoid, confirming results of others. The velocity of the growth curve was found most rapid from July 1 to August 5, and the data were fitted by the exponential equation $H=Ae^{kt}$, when written in the linear form. The variable expressing the velocity of this period was associated with yield.

Relation of maturity in Bliss Triumph potato seed stocks to effectiveness of ethylene chlorhydrin and other treatments, G. R. TOWNSEND (*Florida Sta. Bul.* 362 (1941), pp. 40).—Numerous stocks of Bliss Triumph potatoes of diverse origins, and often differing in maturity and storage periods, were variously treated with ethylene chlorhydrin (40 percent) solution, as whole or cut tubers, principally during the period 1934-40 at the Everglades Substation. A number of seed stocks also received supplemental treatments with standard fungicides. Practical suggestions for the use of the treatment are included, together with a comprehensive review of literature on potato seed stocks covering 43 titles.

The treatment has been valuable for the fall crop, for by hastening sprouting many seed pieces are saved from decay and the crop usually matures early enough to escape frosts. When fall-crop potatoes are used as seed for the spring crop, the treatment is needed to start growth early enough to produce a crop before hot weather prevents tuber setting. Increases in stand and yield

have varied with stocks and seasons but in general have been of importance. The greater productiveness of seed stocks harvested when somewhat immature was demonstrated.

Failure of treatment may result from a dipping solution too weak to stimulate very dormant tubers, or strong enough to injure the seed pieces. Immature stocks could be treated with much stronger solutions than more mature stocks, probably attributable to their ability to generate wound periderm over the cut surfaces. Danger of overtreatment in the fall might be reduced by allowing cut tubers to heal for not more than 24 hr. before treatment, by reducing the strength of the solution, by shortening the storage period after treatment to 16 hr., and by treating late in the day to take advantage of the lower night temperatures. When very dormant stocks must be treated for spring planting, freshly cut sets may be treated with strong solutions and the treatment period prolonged. Use of fungicides on whole tubers or cut sets has not been beneficial in reducing decay. In fact, lime, sulfur, formaldehyde, and the mercury fungicides sometimes have been observed to increase the decay of sets, probably related to the rapidity with which wound periderm can be generated and effects of the chemicals upon generative cells.

Effect of environment on composition of soybean seed, J. L. CARTER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 125-130).—Soybean varieties grown at the Illinois, Indiana, Iowa, Missouri, and Ohio Experiment Stations, 1936-39, were found to differ significantly in oil and protein content and in I number of the oil. Climatic and soil factors had no significant effects on the relative standing or ranking of the several varieties in oil and protein content. Direct fertilizer application on a soil medium to good in fertility had little effect on the composition of the seed. On an infertile acid soil lime increased protein content and decreased oil content, while phosphates increased the percentage of P in the seed. No noticeable effect on composition of soybean seed resulted from wide differences in fertility levels maintained in an old rotation by manure and fertilizers.

Soybean production in Iowa, E. S. DYAS (*Iowa Sta. Bul. P30, n. ser.* (1941), pp. 33-47, figs. 6).—Practical recommendations regarding soybeans, based on research of this and nearby stations (E. S. R., 81, p. 642), deal with varieties, cultural practices, harvesting for grain and hay, and effects of the crop on soil productivity. Indicated practices include a well-prepared seedbed, with thorough surface tillage before planting, especially where the beans are drilled solid, planting solid with a grain drill 2 bu. per acre, or spacing rows 21-42 in. apart; one to several cultivations; inoculation of seed; the Mukden variety for northern Iowa, Illini in southern Iowa, and Manchu and Dunfield throughout the State, either for seed or hay; planting the seed crop soon after normal dates for corn; and for hay planting to reach the hay stage in late August or early September and cutting when pods are one-half to three-fourths full, before the lower leaves begin to yellow and drop. In general, the crops should be limited to the more level land not subject to serious erosion.

[**Research on sugar beet production and improvement**] (*Amer. Soc. Sugar Beet Technol. Proc.*, [2] (1940), pts. 1, pp. 1-84, 85-102, 106-157, figs. 14; 2, pp. 158-198, figs. 3).—Technical papers of interest to agronomists and plant breeders, presented at Denver, Colo., on January 3-6, 1940, and published in part 1 include Some Illustrations of Methods in Plant Breeding, by H. K. Hayes (pp. 1-17) (Minn. Expt. Sta.); Some Modern Advances in the Study of Plant Nutrition, by D. R. Hoagland (pp. 18-26) (Calif. Sta.); Agronomic Problems of the Sugar Beet Industry in Relation to a Research Program, by H. C. Rather (pp. 27-31) (Mich. State Col.); Comparative Yields of Equal Plant Populations of Sugar Beets with Different Spacing Relations (pp. 32-36), and Comparison of Some

Advanced Generations of a Hybrid Strain of Sugar Beet with the Original Third Generation Selection (pp. 149-154), both by G. W. Deming (U. S. D. A. and Colo. Sta.); Post-Thinning Losses and Their Causes, by A. C. Maxson (pp. 37-39); A Study of Sugar Beet Growth at Jerome, Idaho, by D. E. Smith (pp. 39-41); Influence of Planting Date and Cultural Practices on Sugar Beet Seed Production, by B. Tolman (p. 41) (U. S. D. A.); Main Considerations Followed in Developing Commercial Beet Seed Growing in the Salt River Valley of Arizona, by I. M. McDonald, A. A. Mast, and R. C. Wood (pp. 42-46); The Storage of Beets Between the Time of Harvesting and Slicing in Southern Alberta, Canada, by A. E. Palmer (pp. 46-51); A Preliminary Report on the Effect of Temperature and Beet Conditions on Respiration and Loss of Sugar from Beets in Storage, by C. G. Barr, E. M. Mervine, and R. A. Bice (pp. 52-63) (U. S. D. A. and Colo. and Calif. Stas.); Results of Field Trials of Boron and Treated Seed in the Great Lakes Company Territory, by M. W. Sergeant (pp. 63-66); Phosphorus Deficiency Blight of Sugar Beets Often Called Black Heart Blight, by R. A. Jones (pp. 66-68); Applying Fertilizers to Sugar Beets in Ontario, by H. W. Brown (pp. 68-74); The Effect of Soil Structure on Sugar Beet Growth, by R. B. Farnsworth and L. D. Baver (pp. 74-84) (Ohio State Univ.); Feed Value of Beet Tops, by N. J. Muscavitch (pp. 85-90); Dusting and Spraying for the Control of Blight of the Sugar Beet, by H. C. Young (pp. 90-99) (Ohio Sta.); A Study of Spacing Effects with Two Varieties of Sugar Beets on a High and Low Level of Soil Fertility, by A. W. Skuderna and C. W. Doxtator (pp. 100-102); The Use of Soil Moisture Determinations to Regulate Irrigation Practices in Commercial Beet Fields, by J. E. Coke and H. I. Hechman (pp. 106-108); List of Characters and Gene Symbols Reported for the Species *Beta vulgaris* L. (pp. 109-113), and The Induction of Polyploidy in *Beta vulgaris* L. by Colchicine Treatment (pp. 118-119), both by F. A. Abegg (U. S. D. A.); Indications of Polyploidy in Sugar Beets Induced by Colchicine (pp. 120-121), Nuclear Phenomena in the Pollen Tube of Sugar Beets (pp. 121-122), and Sugar-Beet Pollen Germination in Relation to Environmental Conditions (pp. 133-140), all by E. Artschwager (U. S. D. A.); The Three Dimensional Quasi-Factorial Experiment with Three Groups of Sets for Testing Sugar Beet Breeding Strains, by H. L. Bush (pp. 113-116); Comparison of Quasi-Factorial and Randomized Block Designs for Testing Sugar Beet Varieties, by A. W. Skuderna and C. W. Doxtator (pp. 116-118); A Comparison of Three Methods of Harvesting Sugar Beet Plots, by A. W. Skuderna (pp. 122-127); A Method of Correcting Tonnage of Sugar Beets for Variation in Percent Stand, by H. L. Kohls (pp. 128-132a) (Mich. Sta. and U. S. D. A.); Breeding Methods with Sugar Beets—Greenhouse and Field Technique, by C. W. Doxtator (pp. 141-143); A Study of Sugar Beet Hybrids, by H. W. Dahlberg (pp. 143-144); Performance of Tonnage, Intermediate and Sugar Types in Some Intermountain Districts, by C. E. Cormany and F. F. Lynes (pp. 145-146); Performance of Direct Increases of Pedigreed and Commercial Lots of Sugar Beets, by H. E. Brewbaker (pp. 147-148); and Progress in Genetics—New Methods in Plant Breeding, by G. H. Siegmundfeldt (pp. 155-157).

Papers in part 2 include Research on Sugar Plants and Some Practical Adaptations, by E. W. Brandes (pp. 158-165) (U. S. D. A.); Report on 1939 Tests of U. S. 200 × 215, by G. H. Coons, D. Stewart, H. W. Bockstahler, J. O. Culbertson, G. W. Deming, J. O. Gaskill, J. G. Lill, and S. B. Nuckols (pp. 165-168); Breeding for Resistance to Leaf Spot and Other Characters, by H. W. Dahlberg, A. C. Maxon, and H. E. Brewbaker (pp. 169-180); Principal Features of the Seed Accession System in Use by the Great Western Sugar Company, by H. E. Brewbaker (pp. 181-184); Studies on Some F₁ Sugar Beet

Hybrids, by F. F. LYNES and C. E. CORMANY (pp. 185-190); Further Studies of Sugar-Beet Seed Ball Extracts with Special Reference to the Toxicity of Hydrolyzed Ammonia, by M. STOUT and B. TOLMAN (p. 191) (U. S. D. A.); and Resistance to *Fusarium* Yellows in Sugar Beets, by H. W. BOCKSTÄHLER (pp. 191-198) (U. S. D. A. et al.).

Boron deficiency relations in sugar beets grown for seed in Oregon, G. L. STOKER and B. TOLMAN. (U. S. D. A. et al.) (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 657-665, figs. 4).—Foliage of sugar beets receiving B remained green through winter, while foliage of B-deficient beets was damaged severely by freezing; and during cold weather root cankers also developed extensively in the roots of such beets. The B-deficiency symptoms largely disappeared during early spring but reappeared during rapid seedstalk elongation. Symptoms on seedstalks were manifested first by dwarfing of the seedstalk accompanied by an unusually dark green foliage and developing inflorescence. This was soon followed by distortion and blackening of the upper part of the central seedstalk and darkening and death of some or all of the lateral floral shoots. Affected plants often recovered partially, and the multiple second-growth shoots formed a witches'-broom type of inflorescence. Fall application of 25-35 lb. of borax prevented development of deficiency symptoms during winter and during the seed production period the next summer.

Preliminary results on delayed harvest of sweetpotatoes for industrial purposes, G. P. HOFFMAN and J. M. LUTZ. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 303-307).—The quality of the crop and its behavior in storage, 1936-38, showed that in a normal year it may be practicable to harvest sweetpotatoes for immediate manufacture of starch as late as November 20-30, a month later than the usual date near Meridian, Miss. Such late-harvested roots, however, cannot be stored with consistent degree of success because of danger of decay. The results suggested that with too prolonged delay, serious starch loss may occur even though the roots appear sound at harvest.

Root systems of Bright Belt tobacco, L. J. GIER (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 780-787, figs. 4).—Root systems of over 700 Yellow Mammoth tobacco plants, ranging from seedlings to mature plants, were studied under field conditions on four soil types in Harnett County, N. C. Root distribution evidently was not correlated with pH or moisture equivalent but seemed to be limited by factors associated with soil texture. The 248 roots (72 percent adventitious) of a mature plant filled the cultivated layer of the A horizon. The total length of a mature root system averaged 260 m., with a maximum of 432. The shoot: root ratio ranged from 4.95:1 to 13.0:1 and averaged 10:1. While these variations were attributed to competition, blue mold, cultural methods, and perhaps other factors, they suggested that the shoot: root ratio is an unreliable index to the nature and efficiency of a root system. The minimum number to be used with safety for ratio studies is about 25 plants, although significance was shown on all dates when more than 15 plants were used.

The level of exchangeable potassium in soils under Burley tobacco in the central bluegrass region and its relation to the growth of the crop. C. E. BORTNER, M. E. WEEKS, and P. E. KARRAKER. (Ky. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 269-273).—Burley tobacco on soils adequately supplied with N and P and having less than about 325 lb. of exchangeable K per acre in the plow layer at setting or shortly thereafter usually responded to addition of K fertilizers in studies, 1939-40. K fertilizers did not increase the plant heights markedly, but did increase leaf spread and improve quality. Combined treatment of K and N prevented frenching in fields where it occurred on unfertilized soil. K alone either reduced or prevented frenching, and N alone did

not prevent it but reduced its severity. Where leafspot was causing damage, K-treated rows were either free from injury or only lightly spotted.

Relation of glume strength and other characters to shattering in wheat, O. A. VOGEL. (Wash. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 583-589, figs. 3).—Studies on eight varieties of wheat, ranging from highly resistant to susceptible as to shattering, employed a new device to measure glume strength. The outer glumes of the second spikelet from the tip of the head usually were weaker than those of any other spikelet. The strength of the outer glumes increased progressively down the spike. Except in the tip floret, the second glume tended to be stronger than the first glume of a given spikelet in six varieties and about equal in the other two. The glumes of the tip spikelets were stronger than those of the second and in some varieties were stronger than those of any other spikelet and shattered less. The second floret, however, shattered more easily than the first in almost every spikelet. Other characters favoring shattering include long glumes, lemmas, and awnlets, and lax, nonclavate, erect spikes. Awns of the Kharkof type, by cushioning shocks of colliding heads, tend to reduce shattering losses over those which could occur if such awns were absent.

Control of field bindweed by dry chlorates, E. A. HELGESON (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 7-8).—Good control of bindweed was obtained with 6 lb. of sodium chlorate per square rod applied in November, March, June, and July. Failure of treatment in May and certain of those in June might be attributed to adverse weather. Four-lb. rates in late fall were promising, whereas 2-lb. treatments were too light at all times. Fall applications appear to offer the surest and cheapest means of control.

Pricklypear control on short-grass range in the central Great Plains, E. F. COSTELLO (*U. S. Dept. Agr. Leaflet 210* (1941), pp. [1]+6, figs. 3).—Pricklypear (*Opuntia polyacantha*), a weed cactus (E. S. R., 82, p. 42) increasingly infesting range areas in the central Great Plains in recent years, is described with special reference to its spread and control. In tests in northeastern Colorado, 1936-37, grubbing with a shovel and either piling and leaving the detached plants or hauling them off in trucks was the most effective method for light stands. A road grader pulled by a tractor removed more than 95 percent of the cactus and approached grubbing in efficiency. It was much faster than the hand method, requiring only 20-30 min. per acre, and also left the plants in windrows, facilitating removal from the range. It was particularly useful in heavy stands. Eradication by means of a 15-ft. railroad iron pulled behind a tractor was the least efficient of the methods tried. On the level ground the rail removed 90 percent or more of the plants but on rough hummocky ground only 40-60 percent. Acre costs approximated \$1-\$3 for grubbing and hauling high infestations; for complete removal with the grader, \$1.82; and raiiling, piling, and hauling, except in heavy stands, from \$1 to \$3.25. The choice of a control method depends upon density of cactus to be removed and available labor and equipment. Proper grazing control and other practices subsequent to treatment are discussed briefly.

HORTICULTURE

[**Horticultural investigations in the Southern States**] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 157-158, 165-168, 169-173).—Abstracts of the following papers are listed in these proceedings: Pruning and Training of Tomatoes, by L. R. Farish and G. P. Hoffman (pp. 157-158) (Miss. Expt. Sta. and U. S. D. A.); Nitrogen Requirements of Peach Trees in the Sandhills During the Summer, by C. F. Williams (pp. 165-166) (N. C. Sta.);

Recent Research on the Fertilization of Peaches (p. 166) and Recent Developments on Planting, Cultivation, and Cover Crop Practices (pp. 166-167), both by L. E. Scott (S. C. Sta. and U. S. D. A.); Fruit Thinning and Pruning Peaches, by T. E. Ashley (pp. 167-168) (Miss. Sta.); Pecan Seedling Growth Response to Boron, by G. H. Blackmon (pp. 169-170) (Fla. Sta.); Rooting Pecan Stem Tissue by Layering, by A. C. Gossard (pp. 170-171) (U. S. D. A.); Pollen Studies With Plums Representing Certain Species and Interspecific Hybrids, by W. S. Flory, Jr., (pp. 171-172) and Crossing Relations of Some Diploid and Polyploid Species of Roses, by J. C. Ratsek, W. S. Flory, Jr., and S. H. Yarnell (p. 172) (both Tex. Sta.); and The Growth Cycle and the Effect of Planting Stock Size on the Production of Marketable Bulbs and Flowers of Paperwhite Narcissus, by R. D. Dickey (pp. 172-173) (Univ. Fla.).

[Horticultural investigations by the New Hampshire Station] (*New Hampshire Sta. Bul. 330 (1941), pp. 35-38, 39*).—Among the studies discussed by A. F. Yeager, J. R. Hepler, L. P. Latimer, G. P. Percival, W. W. Smith, H. S. Clapp, and W. D. Holley are the use of Elgetol for the control of blooming of apple trees; the breeding of beans, muskmelons, and tomatoes; the use of colchicine in the production of polyploids; boron requirements of fruit and vegetable plants; fruit and vegetable variety tests; the use of hormone sprays on apples and peaches; medicinal herbs; the storage of apples; blueberry improvement and propagation; squash culture; external treatments for stored squash; and the breeding of lilacs.

[Horticultural studies by the University of Puerto Rico] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 72-78, 106-114, 114-121, 122, figs. 2*).—In addition to reports of studies previously noted (E. S. R., 83, p. 625; 86, p. 42), data are reported by J. Guiscafré Arrillaga, L. A. Gómez, J. S. Simons, L. A. Serrano, A. Riollano, F. J. Juliá, and E. Molinary Salés on seedlings of the avocado; propagation of citrus; fertilizers for grapefruit; fertilizers and shade crops for coffee; nectar from mangoes; and varieties of papaya and pumpkin.

[Horticultural studies by the Vermont Station] (*Vermont Sta. Bul. 475 (1941), pp. 35-38*).—Activities on the following studies are discussed by M. B. Cummings and C. H. Blasberg: The use of naphthaleneacetic acid in preventing premature dropping of McIntosh apples; the effect of fertilizers on bud formation, fruit setting, and growth in the apple; and the effect of potassium fertilizers on the keeping of the apple.

What happened to horticultural plants during the November blizzard, T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.], 75 (1940), pp. 197-204, figs. 3*).—An account is presented of the effects of the November 11, 1940, blizzard which caught fruit and ornamental plants in an immature condition and caused very severe losses. Information is given as to the species and varieties injured and the nature and extent of the injury. In the experimental apple orchard at Ames, Jonathan and Sharon on Hibernial and Virginia Crab trunks and roots survived in fine condition. Varieties which withstood the freeze included Oldenburg (Duchess), Wealthy, Whitney, Yellow Transparent, Hawkeye Greening, Norwel, Edgewood, Secor, and Haralson. Recommendations as to the pruning and handling of injured trees is presented.

The influence of vitamin B₁ and other growth-promoting substances on the growth of plants, E. S. HABER and S. W. EDGECOMBE. (Iowa State Col.). (*Iowa State Hort. Soc. [Rpt.], 75 (1940), pp. 142-153, figs. 9*).—The treatment of greenhouse lettuce with various materials, including vitamin B₁ applied weekly in a solution of 1:100,000 parts of water, failed to improve yields

above the control. One dust treatment applied to the roots at transplanting was definitely harmful. In the case of cosmos plants growing in compost, B₁ applied in the above manner appeared to increase the size of the plants, but not significantly. The treatment of Marion Market cabbage seedlings with vitamin B₁ solution gave no significant results. In the case of cabbage and cauliflower, the use of a fertilizer starter solution was beneficial as measured in yield, but the B₁ solution applied to the roots before setting had no effect. Some benefit was obtained, in the case of geranium and *Iresine* cuttings rooted in sand, from a proprietary growth-promoting substance, and there was some indication that the adding of vitamin B₁ to the above substance further increased its effectiveness. Vitamin B₁ was ineffective in increasing growth or preventing loss of transplanted bean plants. Severely pot-bound *Cineraria* and *Asparagus sprengeri* plants showed some benefit from vitamin B₁ solutions. Vitamin B₁ had no effect on bentgrass or bluegrass development, and the treatment of bluegrass seeds with sebacic acid was distinctly harmful. Immersion of the roots of young Hibernial and Virginia Crab apple trees in a solution of vitamin B₁, 1:100,000 for 30 min., was of little, if any, benefit, and not equal to the effect of adding peat to the soil at planting time.

Vitamin B₁ treatment of cuttings and seeds, E. S. HABER and E. SWIFT. (Iowa State Col.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 153-156).—Lantana cuttings rooted in sand in a 65° F. temperature were not benefited by vitamin B₁ treatment. At 50° there was a slightly higher percentage of rooted cuttings. The immersion of lantana cuttings for 24 hr. in a vitamin B₁ solution was definitely harmful, but the same treatment gave slightly beneficial results with another species. The results with the above species and also with snap beans led to the conclusion that watering sand with a vitamin B₁ solution may increase the percentage of rootings when temperatures are too low for the optimum rooting of cuttings. At favorable temperatures B₁ had no effect. Tomatoes and sweet corn did not respond to B₁ at either 50° or 65°. At a concentration of 1:50,000, vitamin B₁ is apparently toxic to seeds soaked therein.

Changes in the carbohydrate and nitrogenous constituents of cuttings as affected by hormone treatment, I, II, B. W. DOAK (*New Zeal. Jour. Sci. and Technol.*, 22 (1941), No. 4B, pp. 192B-198B, figs. 2; pp. 198B-201B).—This paper is presented in two parts, the first of which deals with *Forsythia* cuttings treated for 18 hr. with naphthaleneacetic acid at a strength of 1:30,000 parts of water before placement in sand held at 65° F. Analyses at frequent intervals showed the treated cuttings to accumulate gradually more reducing sugars in the lower inch than did the controls, which had similar treatment except that distilled water was used instead of the hormone solution. The increase in reducing sugars was at the expense of the total sucrose present. There was a very large increase in the amino N and amide N in the treated cuttings. The results indicated that the chief effect of the hormone was to accelerate the rate and intensity of normal changes in cuttings.

Part 2, dealing with *Rhododendron* cuttings treated with β -indolebutyric acid, α -naphthaleneacetic acid, and α -naphthaleneacetic acid plus alloxan, showed that the α -naphthaleneacetic acid was more effective in mobilizing nitrogenous materials, except nonprotein N, in the base of the cuttings than was the β -indolebutyric acid. On the other hand, the β -indolebutyric acid exerted a greater effect on sugars than the α -naphthaleneacetic acid. The alloxan addition increased the effect on the sugars.

Effects of talc dusts containing phytohormone, nutrient salts, and an organic mercurial disinfectant on the rooting of herbaceous cuttings,

N. H. GRACE (*Canad. Jour. Res.*, 19 (1941), No. 5, Sect. C, pp. 177-182).—Cuttings of *Coleus blumei*, varieties of *Chrysanthemum*, and species and varieties of *Iresine*, treated with a series of talc dusts containing naphthylbutyric acid, nutrient salts, and ethyl mercuric bromide, were propagated in sand in the greenhouse. The naphthylbutyric acid treatment increased the number of roots per cutting and when combined with a mixture of nutrient salts increased the fresh root weight of *Coleus* cuttings. Organic mercury treatment increased, up to 5 percent, the number of *Chrysanthemum* cuttings that rooted and increased the number of roots on *Iresine* cuttings. Beneficial effects from talc alone featured the results. Differential reactions to both talc and organic mercury treatments were shown by closely related varieties.

The bordeaux formula in horticultural research, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 153-156).—An apparent lack of uniformity in the understanding of any given formula for bordeaux mixture led the author to send questionnaires to a widely distributed group of workers to obtain their interpretation of the significance of a 4-4-50 formula. The answers revealed a surprising lack of agreement in methods of preparation and even in the materials used. Apparently many of the conflicting results reported from the use of bordeaux mixture may be attributed to the use of different materials and combinations in preparing the mixture.

A simple method of making tree injections, W. H. FRIEND. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 203-204).—The author describes a method utilizing $\frac{5}{8}$ -in. garden hose for injecting various fungicidal and nutrient materials into trees. Copper sulfate, in a 1-percent water solution, produced the most favorable response in grapefruit trees affected with little leaf. Zinc chloride solutions of the same strength gave the best results with Temple oranges affected with chlorosis. Large trees required injections at several points, and in the case of dry root gum disease deep borings were necessary to reach the diseased heartwood.

Refractive index as an estimate of quality between and within muskmelon fruits, T. M. CURRENCE and R. LARSON. (Minn. Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 611-620, figs. 2).—In studies with 30 muskmelons representing a mixture of types, it was found that hand refractometer readings on the soluble solids content of the juice may be valuable in measuring quality. Taste tests by 19 people on the same melons showed a standard error of 0.93, indicative of the difficulty of grading melons by taste unless the average of a number of opinions is obtained. Ratings by three experienced testers did not approach the mean scores appreciably closer than the ratings of three testers chosen at random.

In another test where 10 melons were cut into sections, taste determinations showed a slight but significant quality difference in favor of the blossom over the stem end. Refractometer readings failed to show statistically significant differences between the sections of the melon, suggesting that quality differences may be determined by factors other than those measured by the refractometer. In the 10 melons there was a positive correlation between fruit weight and quality score as well as between refractometer reading and quality score.

Effect of stage of maturity at time of harvest on germination of sweet corn, C. W. CULPEPPER and H. H. MOON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 6, pp. 335-343).—Studies of the effect of stage of maturity on the germinating power of the grains of sweet corn indicated that the grains may be made to germinate when they have attained only a fractional part of their full development if they are appropriately dried after being harvested. At early stages of development, in which only a small percentage germination was obtained, the young plants were weak and had the appearance of rye or

some small-seeded grass. Kernels taken from ears harvested at stages of optimum table quality germinated well and when planted grew into normal plants. It was apparent that sweet corn could be harvested when the ears were in prime eating condition and a part of the ear used for physical, chemical, and quality tests and the remainder preserved for seed. With this procedure selections could be made at the stage of maturity when differences were of greatest importance. The procedure was followed for three successive generations, thus enabling a breeder to isolate desirable strains. It is thought that the new procedure would be particularly valuable in the vicinity of Washington, D. C., where the climatic conditions during the ripening of sweet corn are often such as to cause deterioration of the material for planting purposes.

Anatomical and physiological responses of the tomato to varying concentrations of sodium chloride, sodium sulphate, and nutrient solutions, H. E. HAYWARD and E. M. LONG. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 437-462, figs. 10).—With nutrient cultures at osmotic concentrations of 0.5, 1.5, 3.0, 4.5, and 6.0 atmospheres, the maximum vegetative growth was obtained at 1.5 with a pronounced depression at higher concentrations. In cases where the high osmotic concentrations were obtained by the addition of sodium chloride or sodium sulfate the growth depression at isosmotic concentrations was greater than in base nutrient cultures. Plants in the high sodium sulfate cultures were smaller than those in the corresponding sodium chloride cultures, suggesting an ionic influence in addition to the effect of the total salt concentration. In all series the cells of the mechanical tissues were smaller in caliber and thicker walled in plants grown at high osmotic concentrations. Cambial activity was inhibited by high concentrations of salts in all series. The percentage of dry matter of tops remained essentially constant at all levels of concentration in the sodium chloride series and increased at the high concentrations in the base nutrient and sodium sulfate cultures. Flower bud formation was retarded and probably reduced in plants grown in high sodium chloride solutions, and anthesis was delayed. Osmotic concentration of the sap increased in all series with an increasing concentration of the culture solution.

An inexpensive homemade scale for weighing fruit, R. L. McMUNN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 205-208, figs. 2).—The construction and operation are described and discussed.

New seedling fruits productions of 1940, H. L. LANTZ. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 124-128).—Observations upon the unusual number of seedlings which fruited in 1940 on the station orchards indicated that certain parental varieties and combinations were notably successful in their yield of worth-while seedlings. The progeny of certain apple crosses are briefly discussed with reference to their outstanding characteristics in tree and fruit.

Report of damage to fruit plants by the November, 1940, cold, V. W. KELLEY and R. L. McMUNN. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 54-65).—Information is presented on the nature and extent of injury caused by the disastrous freeze of November 11, 1940. The apple varieties found most susceptible to trunk injury were Winter Banana, Rome Beauty, York Imperial, and Stayman Winesap. Golden Delicious, Delicious, Grimes Golden, and Jonathan were resistant, and Gano, Ben Davis, and Willowtwig were apparently uninjured.

Influence of soil moisture on photosynthesis, respiration, and transpiration of apple leaves, G. W. SCHNEIDER and N. F. CHILDERS (Ohio Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 565-583, figs. 3).—In a more complete report (*E. S. R.*, 85, p. 53), data obtained in an environment-controlled chamber and in

the field showed a consistent increase in photosynthesis when the moisture in a relatively heavy soil declined below its field capacity. At a temperature of 100° F. the increase in photosynthesis was shorter than at 80°, due probably to the more rapid drying of the soil and the greater transpiration rate at the higher temperature. The first reduction in apparent photosynthesis appeared sooner at the higher than at the lower temperatures. Before wilting was evident there were marked reductions in apparent photosynthesis and transpiration and an increase in respiration. On several occasions fairly high rates of photosynthesis were recorded when the stomata were apparently closed. When the plants showed definite wilting and the soil moisture was approximately at the wilting percentage, there was an 87-percent reduction in both photosynthesis and transpiration. It was not uncommon for wilted apple leaves to absorb from 1 to 10 mg. or more of CO₂ per hour per 100 cm.² of leaf surface. Following the application of water to wilted trees, the leaves attained turgidity usually within 3 to 5 hr., depending on the degree of wilting. Leaves did not recover their original relationships with the controls in photosynthesis and respiration before 2 to 7 days after watering. Transpiration recovered usually about the same time as, or slightly earlier than, photosynthesis. Photosynthetic responses were approximately the same in the field as in the control chamber.

Progress of orchard soil treatment experiments at Iowa State College, B. S. PICKETT. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 136-141).—A comparison of four soil-management treatments, begun in 1939 in an orchard of several varieties of apple, top-worked in 1926 on Hibernial and Virginia Crab rootstocks, indicated that mulching with straw plus 5 lb. of sodium nitrate per tree was a promising method of handling the soil. The yields in 1940 for 36 trees were 797, 736, 679, and 662 bu., respectively, for (1) the mulch, (2) loose bluegrass, (3) loose legumes, and (4) cultivation and cover crop. The nitrate application was identical in all cases—5 lb. per tree. Varieties differed in productivity, but this variation was removed by having all the varieties in equal number in each treatment.

Yields of apples on Hibernial and Virginia Crab stocks, T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 128-131).—Yield records taken over the period 1932-40 on a number of apple varieties, top-worked on Virginia Crab and on Hibernial, showed that in this initial period of production the varieties on Virginia Crab had greatly outyielded the same kinds on Hibernial. On a given stock varieties differed sharply in yield largely because some, such as Hawkeye Greening, were regular in bearing. In a block of Jonathan trees on various stocks, including the conventional French crab, there was observed a notable variation in total yields over the 3 yr., 1938-40. The range was from 1,024 lb. for 10 trees on Dudley roots to 6,175 lb. for trees on 4-7-16, a vigorous open-pollinated seedling of Canada Baldwin.

Pollination experiments with Starking, G. G. BROWN and L. CHILDS. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 142-143).—In pollination experiments with apples in the Hood River Valley, Starking proved to be practically self-unfruitful but set successfully when cross-pollinated with certain other varieties, particularly Blackjon and Blackmack.

Annual bearing of Snow and McIntosh, R. H. ROBERTS (*Wisconsin Sta. Spec. Bul.*, 1941, Sept., pp. [16], figs. 13).—Beginning with a brief discussion of the physiology of the apple tree with respect to growth and fruiting, the author discusses the fruiting habits of Snow and McIntosh apples. In the apple, in general, blossom buds may be formed terminally and laterally on shoots and terminally on spurs. In the Snow variety buds may be formed in all of these positions, but in the McIntosh the blossoms are produced almost altogether on spurs. The McIntosh is annual in bearing for two reasons: (1) A rare production of blos-

soms from terminal or axillary buds on 1-yr. shoots, and (2) the usual heavy early drop of fruit. When successive seasons of short growth occur, no new spurs are formed to continue regular production and a tendency toward biennial fruiting follows. Very heavy open pruning may produce much the same conditions in the McIntosh as are found in biennial varieties, i. e., too few blossoms one year and too many the next. Moderate pruning, on the other hand, is desirable. The McIntosh requires careful attention to fertilization, supplying N just after the trees have fruited heavily and are entering an off year. N should be withheld when the trees are overfull of blossom buds.

Apple thinning experiments, 1940, R. L. McMUNN. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 347-364).—This article, the fourth in a series (E. S. R., 83, p. 339), discusses the results of experiments in a year of light fruit set, due apparently to cold prior to bloom and also to a scarcity of honeybees. All dates of thinning tended to reduce the total crop, but thinning immediately after the June drop was least harmful in this respect. Old Wealthy trees in a good state of vigor and moderately pruned were able apparently to size up a crop representing about 4-5 percent and young Golden Delicious trees a crop of about 7-8 percent of a snowball bloom. The use of ringing and scoring and other practices designed to affect the set of fruit and the size of apples showed some benefit, but the results led to the general conclusion that these practices are not to be recommended until natural procedures, such as improved care of the orchard and the providing of pollinizers and adequate bees, have failed.

A continuous apple thinning experiment conducted from 1920 to 1939, D. V. FISHER and R. C. PALMER (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 193-195).—In this further report (E. S. R., 78, p. 631) covering a period of 20 yr. of thinning, in which the same trees were handled alike throughout, data are presented to show that in a given variety 9-in. and 6-in. thinning resulted in practically the same total yields as did 3-in. thinning. The results are believed to be due in part to increased bearing area and to increased size of fruits on the heavily thinned trees. The four varieties in the trials differed in their inherent productivity. Heavy thinning is deemed particularly desirable with such varieties as Delicious and Rome Beauty, where large-sized apples are most profitable.

Anti-drop harvest spray demonstrations in Iowa, S. W. EDGECOMBE. (Iowa State Col.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 156-168, fig. 1).—The application of two proprietary materials designed to delay the dropping of apples just prior to the regular harvesttime gave good results in several commercial orchards, except when the fruit was allowed to remain on the trees too long after spraying. With Jonathan the decrease in drop was sufficient to yield a distinct financial return. Good, but not as definite, results were obtained with Delicious. It is suggested that two sprays are probably needed in years of high temperature and low precipitation. The first spray might be applied 2 weeks before the time of dropping and the second just as dropping begins.

The effect of plant hormone sprays on the dropping of apples, H. C. AITKEN (*Nova Scotia Fruit Growers' Assoc. Ann. Rpt.*, 77 (1940), pp. 120-124, figs. 2).—Naphthaleneacetic acid sprays were found effective in retarding the preharvest drop of Gravenstein apples. By using two sprays it was possible to retain over 50 percent of the crop until the apples were overmature. One spray was sufficient to hold the fruit on the trees for not more than 10 days past the normal harvest date. Favorable results were obtained also with the McIntosh variety.

Magnesium deficiency of apples in the Nelson District, New Zealand, E. B. KIDSON, H. O. ASKEW, and E. CHITTENDEN (*New Zeal. Jour. Sci. and Technol.*,

21 (1940), No. 6A, pp. 305A-318A, figs. 5).—Premature defoliation, identified as a magnesium deficiency, was prevented by the injection of magnesium sulfate into the branches of affected trees. The symptoms varied somewhat with varieties, but the more characteristic features were brown blotching of the leaves, particularly between the veins, followed by defoliation. The leaves at the base of new terminals were the first to drop, leaving a characteristic tuft of leaves at the tip. Leaves of affected trees were low in magnesium and high in potassium, indicating that an unfavorable ratio of these two elements in the soil interfered with the intake of magnesium.

The effect of borax on the storage quality of Jonathan apples, E. CHITTENDEN and R. H. K. THOMSON (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 6A, pp. 352A-356A).—Borax applied to Jonathan apple trees at the rates of 0.5, 1, and 3 lb. per tree caused injury to the fruit harvested in the second year following application. There was less injury than in the first year (E. S. R., 80, p. 344), but the amount of damage was large, especially in the 3-lb. treatment. The boron content of the fruit was higher than in the controls and was in direct ratio to the size of application. No harmful effect was observed on the fruit from trees sprayed with borax at strengths of 0.1, 0.15, and 0.25 percent in combinations with the regular sprays.

A Royal apricot sport of short chilling requirement: Origin and transmission of characteristics to seedlings, W. E. LAMMERTS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 175-178, figs. 2).—In 1937 crosses were made between a sport of Royal apricot, characterized by a short chilling requirement, and Newcastle. In addition flowers of the sport designated as Early Royal were self-pollinated. Crosses were made between the regular Royal apricot and Newcastle for comparison. Observations on the resulting seedlings showed those of the Early Royal \times Newcastle cross and of the Early Royal selfed to be very early in leafing out and to attain full leaf much sooner than the trees of Royal, Newcastle, or of a cross between these two. The contrast was particularly striking following the very mild winter of 1940. Evidently the Early Royal sport transmitted its low chilling requirement to its progeny as a dominant character. The author points out that this is one of the few cases in which a horticultural sport has transmitted its characters to seedling progeny.

An acquaintance with peach varietal types is essential in peach breeding to secure improved varieties, M. A. BLAKE. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 144-147).—The author discusses certain types of peaches, such as the Crawford, J. H. Hale, Greensboro, vegetative, etc., and their behavior and value in crossing. When Early Crawford was crossed upon Elberta the progeny were all of the Early Crawford type in both tree and fruit. J. H. Hale is characterized by a relatively small, thickly twigged tree and lacks the productiveness, hardiness, and adaptability of Elberta. Greensboro tends to transmit to its seedlings its habit of having many large fruit buds per foot of annual growth. Other Greensboro characters, such as flat cheek and rapid softening of the flesh at the apex and suture, tend also to be dominant in crossing. The vegetative type tends to grow vigorously late in the season and to develop a light set of fruit buds. There are said to be many different types of peaches, depending on the factors employed in classification. A knowledge of these types is considered helpful in the breeding of improved varieties for special regions and uses.

Studies on time of peach thinning from blossoming to maturity, J. H. WEINBERGER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 137-140).—Thinning experiments conducted in Georgia over a 3-yr. period on early-maturing peaches—Early Rose, Early Hiley, and Hiley—showed, in general, that

fruit removal at any stage tended to reduce the total crop at harvest but did increase size of individual peaches. With all three varieties the earlier the thinning, the greater was the percentage of fruits in the larger sizes at harvest. In 1938, early-thinned Early Rose and Hiley trees matured their fruits earlier and a greater proportion of the crop was harvested in the first pickings. In the other experiments this effect was not noted, although there was a tendency for the thinned trees to mature their fruit before the unthinned trees. Thinning at blossomtime is considered hazardous because late frosts may remove too many of the remaining fruits. It is suggested that a light blossom thinning, supplemented by a second thinning 6 weeks later, would be a safer practice. At 6 weeks the pits had not begun to harden and the fruits destined to drop were usually smaller than those that would mature. Thinning at 6 weeks or later required less time than the earlier operations.

Effect of freeze damage on citrus trees and fruit in relation to grove practices, W. W. LAWLESS. (Fla. Expt. Sta.). (*Citrus Indus.*, 22 (1941), No. 8, pp. 3, 6-7, 14-15).—In this second contribution (E. S. R., 84, p. 336), further evidence is presented of the favorable effects of a complete nutritional program on the resistance of citrus trees to low temperature injury. Considerable leaf drop, wood damage, and some fruit damage were observed in the NPK trees following the freeze of November 1940, while very little damage was apparent on trees in the complete nutritional program which included also Mn, Zn, Cu, and Mg.

Seasonal changes in the carotenoid pigments in the juice of Florida oranges, E. V. MILLER and J. R. WINSTON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 219-221).—In the period from September to March the total carotenoid pigments in the juice of Florida-grown Parson Brown and Pineapple oranges increased from 2.21 to 5.89 and from 1.55 to 7.04 mg. per liter, respectively. The Valencia orange pigments increased up to and through March and declined in the next 2 mo. Mandarin oranges, with a deeper flesh color, had a greater quantity of carotenoid pigments. The course of development was similar in the sweet and mandarin types. The highest carotenoid content in the sweet oranges, 8.48 mg. per liter of juice, was recorded in Valencia, and the highest in the mandarin type, 24.52 mg. per liter, in the King.

Avocado production in the United States, H. P. TRAUB, C. S. POMEROY, T. R. ROBINSON, and W. W. ALDRICH (U. S. Dept. Agr. Cir. 620 (1941), pp. 28, figs. 7).—General information is presented with regard to races and varieties, production and imports, pollination requirements, and general cultural considerations in the widely separated regions of the irrigated Southwest (California) and the humid Southeast (Florida). Information is offered also as to possibilities of culture in the lower Rio Grande Valley and elsewhere. Among subjects considered are soil selection and management, propagation, pruning, fertilization, control of insect (by H. Spencer) and fungus pests, and storage of the fruit.

Rooting pecan stem tissue by layering, A. C. GOSSARD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 213-214, figs. 2).—The author was able to produce roots from pecan stems with considerable success by trench layering the tops of grafted or budded nursery trees and by air layering shoots of older trees in marcot boxes in conjunction with the indolebutyric acid treatment of Romberg and Smith (E. S. R., 82, p. 195). Apparently the best conditions for rooting were brought about by a combination of etiolation, moisture, a rooting medium, and a root-inducing substance.

Nitrogen content of dormant pecan twigs, G. H. BLACKMON. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 211-212).—Determination of the N content of dormant 1-yr. twigs, taken in January from bearing trees

included in a fertilizer experiment, showed as high or higher percentages of total N in a given variety where either leguminous cover crops were grown or commercial N was applied or where both practices were carried out. Varieties differed somewhat in their response to soil and fertilizer treatments. For example, the N content of Stuart twigs was somewhat lower than that of Frotscher twigs for all treatments.

Boron in pecan nutrition, G. H. BLACKMON. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 209-210).—In 1934, Moore seedling pecans planted in soil and in sand contained in glazed earthen pots were supplied each 2 weeks with 1 l. of a nutrient solution with and without 0.5 p. p. m. of B as boric acid. Ferrous sulfate was added weekly to satisfy the iron needs of the plants. Both sand and soil cultures that received B leached less nitrates, indicating that the seedlings given B absorbed more of the nitrate. In addition, the seedlings receiving B appeared to be somewhat more vigorous. Dry-weight readings on the tops and roots showed greater gains for the B-supplied plants in both soil and sand. The percentage of total N was higher in the tops of seedlings grown without B in both sand and soil. The percentages of total N were the same in the roots of the B and non-B plants in sand, but in the soil cultures N content was higher in the roots of plants receiving no B.

Preliminary experiments on pruning and training of one-year seedling tung trees, J. H. PAINTER and R. H. SHARPE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 215-218, fig. 1).—Of different types of pruning and training compared in a tung plantation consisting of open-pollinated seedlings from a single tree, the method by which the top 3 in. of the tree was cut off and notches made above the buds which were desired to develop into branches gave promising results. These trees had the most desirable vertical spacing of branches. In a second experiment in which two groups of tung trees which had formed crowns at 60-75 cm. and 90-105 cm., respectively, were headed at 24 and 12 in. before transplanting, it was noted that the trees followed their inherent tendencies, i. e., high-crowned nursery trees tended to form high-crowned orchard trees, and vice versa. It was possible by pruning to make the two groups crown alike. There was some evidence that under favorable conditions tung trees may be transplanted without pruning or with corrective pruning only.

Some effects of supplementary illumination with Mazda lamps on the carbohydrate and nitrogen metabolism of the aster (*Callistephus chinensis* var. Heart of France), R. WENGER. (Purdue Univ.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 621-628, figs. 2).—China-aster plants grown in late fall and early winter in a greenhouse with an average temperature of 55° F. responded markedly to light supplied in addition to daylight. The plants without additional light were least vegetative, bloomed the latest, had the fewest blooms, and were high in percentage of carbohydrates and soluble nitrogen but evidently unable to utilize these materials effectively. Plants receiving supplementary light of the lowest intensity, 0.3 footcandles, were earliest to bloom and bore the largest number of flowers. As light intensity was increased to 100 footcandles, vegetative activity increased and the percentage of carbohydrates and soluble nitrogen decreased in the early stages of growth. When the plants reached the flowering stage, composition was very similar in all lots irrespective of light treatment.

FORESTRY

[Forestry studies by the New Hampshire Station] (*New Hampshire Sta. Bul.* 330 (1941), pp. 31-32).—Included are reports on studies by C. L. Stevens

and L. C. Swain of native and introduced forest species, native nut species, selection in the white pine, and the silvicultural requirements of the spruce.

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), pp. 29-31).—Included are brief reports by G. P. Burns on the following studies: Light requirements of forest species, the effect of spacing on the growth of red and white pine, effect of density of white pine stands on soil temperature, and effect of thinning on reproduction in Vermont forests.

Forestry in Mexico, H. A. MEYER (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 395-399, fig. 1).—Information is given on the history of the Mexican forestry movement; area, distribution, and types of forests; forest legislation and organization of the forest service; and the accomplishments and future problems of Mexican forestry.

Climax forests of the Upper Peninsula of Michigan, S. A. GRAHAM. (Univ. Mich.). (*Ecology*, 22 (1941), No. 4, pp. 355-362, figs. 6).—Of trees present in the mixed hardwood-hemlock forests of the Upper Peninsula, only four species, namely, hemlock, sugar maple, basswood, and balsam fir, possess the adequate tolerance and capacity for reproduction on a deep layer of duff and leaf litter to meet the essential requirements of climax species. Attempted reconstruction of the forests as they were some fifty years ago before lumbering operations began indicated the probable occurrence of a devastating fire four or five centuries ago, followed by a succession of (1) aspen, (2) pine, yellow birch, hemlock, and sugar maple, and (3) a decrease of the birch and an increase in hemlock and sugar maple. The pines would have probably disappeared, even without lumbering, leaving a hypothetical climax forest of hemlock, sugar maple, and basswood. The disturbing factors in the development of a forest succession are fire, wind injury, insects, and fungi.

Polyembryony in seeds of southern pines, M. L. NELSON (*Jour. Forestry*, 39 (1941), No. 11, pp. 959-960).—A number of instances of more than one embryo per seed was noted in the 1936-37 season, especially in *Pinus palustris*. Polyembryony was most often characterized by two seedlings, one large and one rather small and usually imperfect. Occasionally the two seedlings were equal in size, and apparently both were capable of normal development. In a few cases three or more seedlings were recorded. Polyembryony appeared more often in some lots of seed than in others of a given species, even though all were collected in a single season.

Fertilizer trials for improved establishment of shortleaf pine, white ash, and yellowpoplar plantings on adverse sites, W. H. CUMMINGS (*Jour. Forestry*, 39 (1941), No. 11, pp. 942-946).—The application of different formulas of NPK fertilizer with acid peat or dolomitic limestone in the mattock holes before setting young shortleaf pine, white ash, and tuliptree (yellow poplar) seedlings resulted in no marked superiority with respect to height increment of fertilized over untreated trees. There was, however, evidence of favorable and of harmful influences of various concentrations of the three major fertilizer elements. The supplemental material, dolomitic limestone or acid peat, may introduce considerable differences in fertilizer response. P was beneficial at the highest level in the fertilizers with peat supplements. K was harmful at the highest level when used with dolomitic limestone. For white ash, N at high levels was beneficial and both P and K at high levels were deleterious. There were no significant effects of N, P, or K on the tuliptree.

Effects of certain soil treatments on the development of loblolly pine nursery stock, L. K. ANDREWS (*Jour. Forestry*, 39 (1941), No. 11, pp. 918-921).—Of several fertilizer and soil treatments applied to a Norfolk sand prior to setting loblolly pine, those which included organic material, such as peat, with a

concentrated fertilizer containing a high percentage of P resulted in the most desirable planting stock. Concentrated fertilizers with a high percentage of P tended to increase root:shoot ratios, but it was evident that rapid leaching of soluble material occurs, suggesting applications a few weeks after germination of seeds. The inclusion of organic materials in the sandy soil tended to favor the development of small branching roots.

DISEASES OF PLANTS

Manuale di patologia vegetale [Manual of plant diseases], R. CIFERRI (Città di Castello, Italy: Tipog. Casa Editrice S. Lapi, 1941, pp. XXIII+730, figs. 256).—Included are maladies and abnormalities of nonparasitic origin and diseases caused by viruses, bacteria, fungi, and phanerogamic parasites.

The Plant Disease Reporter, [October 1 and 15 and November 1 and 15, 1941] (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), Nos. 18, pp. 451-469; 19, pp. 469-493, pl. 1, figs. 4; 20, pp. 494-521, figs. 2; 21, pp. 522-538, figs. 3).—In addition to the host-parasite check-list revision, by F. Weiss (No. 18 *Phoradendron* to *Picea*, 19 *Picramnia* to *Pinus*, and 20-21 *Pinus* continued), the following items are noted:

No. 18.—Transmission of western X-disease and marginal leaf spot of peach in Oregon, by S. M. Zeller and A. W. Evans; a plea for the nematode survey, by G. H. Godfrey; a Root Knot Garden Poll sponsored by the Plant Nematode Council, by H. P. Barss; notes on vegetable diseases in Oregon, by F. P. McWhorter and C. E. Owens; and brief notes on unusual incidence of some bean diseases in Idaho, watermelon diseases in Nacogdoches County, Tex., bleeding necrosis of sweet gum, *Ascochyta* on sorghum in Mississippi, and flax rust prevention by borax.

No. 19.—Thrips injury of peanut seedlings, by G. M. Shear and L. I. Miller, noted on page 357; virus diseases of peach in western Colorado (X-disease or yellow-red virosis and golden-net virus disease), by E. W. Bodine and L. W. Durrell; association of Pierce's disease of grapevines and alfalfa dwarf in California, by W. B. Hewitt and B. R. Houston; field tests with a staminate clone of alpine currant immune from blister rust under greenhouse conditions, by G. G. Hahn; blighted barley in Nebraska, by M. W. Felton; oversummering of oats stem rust on orchard grass in Arkansas, by H. R. Rosen; incidence of ear rots in the 1940 corn crop, by N. E. Stevens; plant diseases in Colorado in 1941, by E. W. Bodine and L. W. Durrell; and brief notes on *Helminthosporium* leaf spot on millet in New Jersey, and southern wilt on lilies in Oregon.

No. 20.—A wilt and root rot of asparagus caused by *Fusarium oxysporum* Schlecht, by S. I. Cohen and F. D. Heald; bacterial ring rot of potatoes in Illinois, by H. H. Thornberry; root knot nematode in parts of west Tennessee, by J. M. Epps and L. A. Fister; gray spot (*Stemphylium solani*) of tomatoes in Texas, by A. L. Harrison; strawberry diseases in Oregon in 1941, by S. M. Zeller; some diseases of belladonna in California and their control, by J. T. Middleton; tobacco diseases in Massachusetts in 1941, by O. C. Boyd; and a survey of cotton boll rot diseases and associated micro-organisms in 1941, by P. R. Miller and R. Weindling.

No. 21.—Tobacco black shank (*Phytophthora parasitica*) is spreading in Virginia, by S. B. Fenne.

Bureau of plant pathology, D. G. MILBRATH (Calif. Dept. Agr. Bul., 29 (1940), No. 4, pp. 268-282).—Progress reports are given on work of the department regarding peach mosaic eradication, western celery mosaic, chestnut blight, Pierce's disease of grapes, potato diseases (bacterial ring rot and viruses), pear blight, *Pittosporum* virus diseases, the southern root rot fungus (*Sclerotium*

rolfsii), cantaloup powdery mildew, watermelon mosaic, white pine blister rust, bulb treatment for root knot nematode, root knot in nursery trees, and vesicular exanthema of hogs in relation to virus diseases of plants.

[**Plant disease work by the New Hampshire Station**] (*New Hampshire Sta. Bul.* 330 (1941), pp. 28-30).—Brief reports, by O. Butler, S. Dunn, and L. P. Latimer, are included on the causes of injury to beans by lime-sulfur sprays; effects of mulching on development of bitter pit in apple fruits; effects of place on mosaic and leaf roll of potato; relative resistance of peony varieties to blight; and spraying for apple scab.

[**Plant disease work by the Vermont Station**] (*Vermont Sta. Bul.* 475 (1941), pp. 34-35, 38).—Brief reports by M. B. Cummings and C. H. Blasberg of current work are included on spraying for apple scab control, potato scab studies, and comparisons of chloroplasts from healthy and mosaicked plants.

Plant pathology (*Philippine Bur. Plant Indus. Semiann. Rpt.*, Jan. 1-June 30, 1939, pp. 73-78).—Reports of progress are included on diseases encountered, diseases of Manila hemp (abacá) and of rice and other cereals, coconut "cadang-cadang" and associated fungi, and legume nodule bacteria (particularly of soybeans).

Quantitative studies on the serological reactions of some plant viruses and of a pea nodule bacterium (*Rhizobium leguminosarum*), A. KLECZKOWSKI (*Brit. Jour. Expt. Pathol.*, 22 (1941), No. 1, pp. 44-58, figs. 3).—Studying tobacco mosaic, aucuba mosaic, and bushy stunt viruses and a strain of pea nodule bacteria, the antibody: antigen ratios in the precipitate formed at equivalence point by these viruses with their homologous antisera were intermediate between ratios for bacterial agglutination and for precipitation of smaller antigens like ovalbumin or blood serum proteins. An aucuba mosaic virus antiserum contained antibodies reacting with aucuba mosaic virus but not with tobacco mosaic virus, in addition to antibodies reacting with both, whereas all antibodies in a tobacco mosaic virus antiserum reacted with both viruses. With the same amount of antibody, maximum precipitate with the rod-shaped tobacco mosaic and aucuba mosaic viruses was much greater than with the spherical (or almost so) bushy stunt virus, and was formed in much greater antigen excess. Qualitative differences between strong and weak tobacco mosaic virus antisera were found.

Virus antagonism, natural host resistance, and the acquired-immunity concept with reference to plants, H. H. MCKINNEY. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 11, pp. 1059-1061).—The so-called acquired immunity in mosaics may be regarded as a type of virus antagonism or selective antibiosis. Tobacco ring spot studies indicated that affected plants do not outgrow the disease, but merely pass from an acute to a chronic phase, or the acute phase continues throughout the life of the plant when succulent growing leaves are wiped with a large amount of virus after the plants have entered the maximum growth-rate period. For the most part, tobacco varieties apparently do not possess a very high degree of susceptibility to ring spot, and it appears that a complete understanding of the disease depends in large measure on a knowledge of the several factors influencing the expression of natural host resistance. It is urged that the term "acquired immunity" be reserved for those cases in which there is no multiplication of an infective agent, as it is believed that carriers manifest at least microscopic and biochemical disorder.

The *Aspergillus glaucus* group, C. THOM and K. B. RAFFER (*U. S. Dept. Agr., Misc. Pub.* 426 (1941), pp. 46, figs. 14).—This group comprises an omnipresent and nearly omnivorous aggregation of fungi showing green heads and yellow perithecia on diverse substrata. A large number of strains have been studied,

including cultures isolated by the authors over a 35-yr. period and those contributed by the great culture collections of the world, many of the latter bearing the specific names under which those strains appeared in the literature. Comparative culture under a wide range of conditions has brought together the strains studied into a series of aggregate species, each characterized by ascospores of a particular size range and with typical markings. Those recognized are *A. repens*, *A. ruber*, *A. chevalieri*, *A. amstelodami*, *A. minor*, *A. umbrosus*, *A. cchinulatus*, *A. medius*, *A. carnoyi*, and *A. niveo-glaucus* n. sp. Within these aggregates, for each of which a type is described, the additional species and varieties recognized are *A. pseudoglaucus*, *A. chevalieri intermedius* n. var., and *A. montevidensis*. The usages represented by strains received under particular names in culture are tabulated to show their place in the proposed arrangement of species. Based on variation studies, forms with the ascospores of a particular series but differing in colony morphology and details of activity are regarded as variants rather than taxonomic varieties.

Experimental consideration of the mold toxins of Gliocladium and Trichoderma, R. WEINDLING (*Phytopathology*, 31 (1941), No. 11, pp. 991-1003, fig. 1).—Potent filtrates active against *Rhizoctonia solani* were secured from *G. fimbriatum* and from certain *Trichoderma* isolates but not from others. The toxins were extracted by lipid solvents, and most effectively by chloroform. The crystalline toxin of *Gliocladium* (gliotoxin) was formed during the logarithmic growth phase. Shaking the cultures gave good yields of gliotoxin in highly acid glucose- or sucrose-containing media. Ammonium salts proved to be better N sources than peptone or nitrates. Mycelium and toxin production showed no correlation. Gliotoxin was more toxic to spores of *Sclerotinia americana* and hyphae of *R. solani* than CuSO_4 and less so than HgCl_2 , but it was harmless to *Gliocladium* spores. Gliotoxin solutions were stable below pH 7.0 at room temperature, but above pH 7.0 the decomposition rate increased with rise in pH. Solutions at pH 2.4 resisted autoclaving at 16 lb. for 30 min. Thermostability decreased rapidly with decrease in acidity. The magnitude and rate of toxic effects increased with rises in temperature. Tested at various pH levels, the maximum activity occurred at pH 8.2, and at pH 9.5 toxicity was immediately lost.

Comparative physiology of crown gall, attenuated crown gall, radiobacter, and hairy root bacteria, A. J. RIKER, M. M. LYNEIS, and S. B. LOCKE. (Wis. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 964-977, figs. 3).—The physiological reactions of the cell-stimulating bacteria, *Phytomonas tumefaciens* (virulent and attenuated), *P. rhizogenes*, and *Bacillus* (= *Alcaligenes*) *radiobacter* were compared. The virulent and attenuated crown gall bacteria were carried below 28°-30° C. where galls develop well on tomato, and above this temperature where galls fail to develop. The hairy root bacteria differed from the others by producing acid from sugar and by failing to initiate growth on inorganic N. Otherwise, all these bacteria proved similar in their utilization of various N and C sources and in their production of CO_2 and H_2S . The virulent and attenuated crown gall cultures appeared quite similar in agglutination tests, in producing minor fluctuations in the osmotic pressure of various media, and in their multiplication in host tissues. No galls developed on tomato, *Sedum*, or *Bryophyllum* above 28°-30°, but galls were produced above these temperatures on several kinds of tobacco. The crown gall bacteria appear to be pathogenic independently of the physiological characters studied.

Growth substance in crown gall as related to time after inoculation, critical temperature, and diffusion, A. J. RIKER, B. HENRY, and B. M. DUGGAR. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 7, pp. 395-405).—

Using growth substances of the heteroauxin group, no significant differences in auxin content were found between inoculated and control tissue 1, 4, 8, and 16 days after inoculation, especially when comparisons were made on a total N basis. Galls and control stems from decapitated tomatoes contained about half as much auxin as those from whole plants, but the gall sizes were similar in both cases. No significant difference was found between the auxin content of tomato stems grown at 27° C., where galls developed, and at 31°, where they did not; neither were there significant differences in the amount of auxin diffusing from stems bearing galls and from control stems.

The experiments of certain other investigators, from which suggestions or claims have been made that substances like heteroauxin were responsible for the pathogenicity of crown gall bacteria, have been repeated, but although their results have been generally confirmed, their conclusions appear unjustified. So far as the authors are aware, the crown gall bacteria are pathogenic independently of auxin production.

The role of certain vitamins and metallic elements in the nutrition of the crown-gall organism, F. C. MCINTIRE, A. J. RIKER, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 1-13, fig. 1).—*Phytomonas tumefaciens* grew very well in a simple synthetic medium containing Fe, Mn, and Zn, which are shown to be important in its nutrition. Growth in this medium was increased only moderately by addition of yeast extract. The evidence presented indicates that stimulation by the organic material in yeast extract may be attributed to thiamin, riboflavin, pantothenic acid, and amino acids. The organism synthesized large amounts of biotin and riboflavin, moderate amounts of thiamin and pantothenic acid, and apparently sufficient amounts of any other such factors as are necessary for growth in the synthetic medium. This character needs consideration in relation to the cell-stimulating capacity of these bacteria. Supplementing the synthetic medium with Mn increased the rate of sugar fermentation and the percentage of fermented sugar converted into gums and cells, but less sugar was accounted for as unidentified products.

Effect of fertilizer materials and soil amendments on development of apothecia of *Sclerotinia fructicola*, K. BAUR and G. A. HUBER. (West. Wash. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 1023-1030, figs. 3).—"The effects of surface applications of hydrated and carbonated lime and of fertilizer salts to the soil under trees, in both dry form and aqueous solutions, on the development of apothecia are here reported. Aqueous solutions of three fertilizer salts proved ineffective; of the dry materials used, only calcium cyanamide prevented the development of apothecia. Calcium cyanamide remained toxic longer when the soils remained relatively dry after application than when the material was exposed to heavy rainfall. By delaying applications until just prior to apothecial emergence, the material remained toxic sufficiently long to prevent development of apothecia. No toxic effects were observed on trees in plats treated with calcium cyanamide. The duster described in this paper was especially designed for the application of calcium cyanamide."

Saltants from a monospore culture of *Verticillium albo-atrum*, J. T. PRESLEY. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 12, pp. 1135-1139, figs. 2).—In an effort to induce rapid sectoring, a single-spore culture of *V. albo-atrum* was grown on various media, the one on which sectors appeared to be produced in greatest abundance being made up of MgSO₄ 0.5 gm., KH₂PO₄ 1.5, NH₄NO₃ 0.05, KNO₃ 2, asparagine 1.5, dextrose 20, and agar 20 gm., and distilled water 1,000 cc. By selective picking of the sectors, cultures were obtained differing widely among themselves and remaining rather constant in appearance throughout repeated transfers. The cultures varied from pure white (mycelial) to grayish

black (microsclerotial) and from aerial to completely appressed. Grown together in Petri dishes, some of the sectors exhibited distinct mutual antagonism. Because of the wide range of cultural characters shown by the various sectors from a single-spore culture a possible bearing on the taxonomy of species in the genus *Verticillium* is suggested.

Defense mechanisms in plants and animals (In *Biological Symposia*, II, edited by J. CATTELL. Lancaster, Pa.: Jaques Cattell Press, 1941, vol. 2, pp. 123-163, fig. 1).—Included are: Local Reactions in Plants, by F. W. Went (pp. 123-132); Generalized Defense Reactions in Plants, by W. C. Price (pp. 133-144); and Local and Generalized Defense Reactions in Animals, by W. Bloom (pp. 145-163).

Seed-borne organisms and plant quarantines, R. H. PORTER (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 543-548).—The author considers the interrelations of seed-, bulb-, corm-, and tuber-borne organisms and plant quarantines as to the extent disease-producing entities are thus carried, methods of detecting them, and the possibility and practicability of establishing proper facilities for the assistance of officials who might be required to regulate the seed commerce.

An analysis of factors causing variation in spore germination tests of fungicides.—III, Slope of toxicity curves, replicate tests, and fungi, S. E. A. MCCALLAN, R. H. WELLMAN, and F. WILCOXON (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 49-77, figs. 7).—In a further analysis (E. S. R., 84, p. 202) of the factors causing variation in spore germination tests, 718 toxicity curves were studied, including 20 compounds, on *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, *Macrosporium sarcinaeforme*, *Botrytis* sp., and *Rhizopus nigricans*. Four types of slopes were observed on logarithmic probability paper, viz, simple straight line, double slope with left-hand "break" in lower values giving a curve concave upward, double slope with right-hand break in upper values giving a curve convex upward, and triple slope (sigmoid curve). The last two types comprised 17 percent of the curves. The type and steepness of curve was determined more by the compound than the fungus. Heterogeneous compounds differing widely in slope, as well as compounds of convex and sigmoid type curves, should be evaluated at high LD levels. Highly significant correlations were obtained between steepness of slope and toxicity at the LD50 point for straight and concave type compounds of the heavy metal and Cu series. No correlation was observed among the organic compounds. These studies indicated the value of the rapid graphic method for general comparisons. Tests replicated the same day with the same lot of spores in general varied no more than expected from their internal error, which was not true for different times and spore lots. There was a linear relation between the logarithms of LD50 and of the number of spores exposed to the fungicide. Errors in adjusting the concentration of a spore suspension will account for only a small portion of the variance in replicated tests. Different fungicides may be rated approximately in terms of a standard, but its most effective use to adjust day-to-day variations is limited to compounds of essentially similar slope and composition. Five of the fungi were essentially alike in average sensitivity, only *Rhizopus* being significantly more sensitive. Sensitivity was not inversely proportional to spore volume. In many cases the fungi were unlike in sensitivity to specific compounds and would thus rate them differently. Such fungi (e. g., *A. solani* and *S. fructicola*) can be efficiently used in laboratory testing. Selection of fungi for laboratory tests should be based on reproducibility of results, ease of counting, and ready production of spores in quantity. Experimental designs to give maximum efficiency of test and evaluation results are outlined.

The spore-germination method of evaluating fungicides, P. D. PETERSON. (Del. Expt. Sta. et al.). (*Phytopathology*, 31 (1941), No. 12, pp. 1108-1116,

fig. 1).—A modified procedure is outlined whereby practical standardization and stabilization of drops of water can be attained by gluing 12-mm. glass circles to the microscope slides with petrolatum, where they serve as standard surfaces onto which measured amounts of fungicides and spores are pipetted either separately or in combination. By this procedure a single 75-by-25-mm. slide can be made to carry as many as 10 treatments. A hanging-drop method of applying the fungicide is also described. Conidia of *Sclerotinia fructicola* from peach failed to germinate satisfactorily in distilled water when so removed from a sporulating surface as to avoid contamination with nutrients from culture media. Of the several nutrients tested, including dextrose, prune-agar extract, and potato-dextrose-agar extract, the last proved most highly stimulatory to the conidia. A nutrient solution made by extracting 0.1 gm. of Difco potato-dextrose-agar powder with 100 cc. of water produced a high-percentage germination. An experiment is outlined whereby each lot of the dry powder can be assayed as to stimulatory dosage.

The influence of lithium salts on certain cultivated plants and their parasitic diseases, N. L. KENT (*Ann. Appl. Biol.*, 28 (1941), No. 3, pp. 189-209, figs. 3).—At concentrations of 1-4 milligram equivalents of Li per liter of soil, LiCl and LiNO₃ reduced the amount of *Septoria apii* leaf spot on celery and increased the weight of the plants. Larger amounts gave better control but injured the host. The Li content of plants was increased by soil applications, and the higher the amount in the leaves the lower was the infection. Applications of the Li salts to wheat seedlings reduced their susceptibility to *Erysiphe graminis* powdery mildew, in small doses stimulated and in large doses retarded growth of the host, and at all concentrations tested increased the Li content of the aerial parts. The higher the Li concentration in both soil and host the less intense was the mildew infection. The susceptibility of wheat seedlings to *Puccinia triticina* leaf rust was reduced by adding LiCl to the soil at the rate of 18 m. e. per liter of soil, but the plants were distinctly injured. Smaller concentrations failed to control. The diameter and weight of tomato galls due to *Phytomonas tumefaciens* were reduced by LiNO₃ applied at the rate of 2.5 m. e. per liter of soil, and the fresh weight of plants treated with LiCl was increased. The effect of LiNO₃ on the yields was negligible. There was a close relation between the Li concentration in the galls and that applied, and the higher the concentration the lower was the gall weight. Excretion of Li from the treated tomato plants was increased by the high concentration in the leaves and by premature leaf fall. The nature of the effects on susceptibility, and the stimulatory and toxic effects, are discussed. There are 63 references.

Boron—a minor plant nutrient of major importance, W. L. POWERS. (Oreg. State Col.). (*Better Crops With Plant Food*, 25 (1941), No. 6, pp. 17-19, 36-37, figs. 3).—A general discussion and review of boron deficiency studies (20 references), with a summary and tabulation of the results of major field trials with boron for alfalfa and clover and grass.

A low-temperature basidiomycete causing early spring killing of grasses and legumes in Alberta, W. C. BROADFOOT and M. W. CORMACK (*Phytopathology*, 31 (1941), No. 11, pp. 1058-1059, fig. 1).—An unidentified low-temperature basidiomycete was found causing extensive killing of certain grasses and alfalfa in Alberta about the time of the first spring thaw, producing a snow mold on grasses and a crown rot on alfalfa. Inoculations have proved it highly virulent on certain grasses, winter wheat, alfalfa, sweetclover, and alsike and white Dutch clovers. The cardinal temperatures are around -4°, 15°, and 26° C. Clamp connections indicate the fungus to be a basidiomycete, but no sclerotia, fruiting bodies, or spores have been found.

Smut sori from ovarial and staminal tissues of certain grasses, E. D. HANSING and C. L. LEFEBVRE. (Kans. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 11, pp. 1043-1046, figs. 2).—Rudimentary ovaries of pedicellate and fertile ovaries of sessile spikelets of *Andropogon furcatus* were affected with *Sorosporium everhartii*. Pistillate sori were also observed in rudimentary ovaries of *A. furcatus* affected with *Sphacelotheca occidentalis* and of *Sorghum halepense* affected with *Sphacelotheca cruenta*. Sori developed from staminal tissue of *A. furcatus* affected with *Sorosporium everhartii* and from staminal and ovarial tissues of sorghum affected with either *Sphacelotheca cruenta* or *S. sorghi*. The male inflorescence of corn is often affected by *Ustilago zaeae* and *Sorosporium reilianum*. Variations in the size and shape of these sori and correlations with the organs from the primordia of which they originated may have diagnostic importance.

Natural ways of transmission of the winter wheat mosaic virus, V. K. ZAZHURILO and G. M. SITNIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 5-6, pp. 429-432).—The mosaic virus was found to overwinter in infested winter wheat seedlings, and the earlier the winter crop was seeded the higher the incidence of infection. With spring wheat, the later sown crop was the one most strongly infected. The explanation of these conditions was found connected with the life history relations of the insect vector, *Deltocephalus striatus*, and the incubation period of the virus.

The occurrence of Darluca filum (Biv.) Cast. on cereal rusts in South India, T. S. RAMAKRISHNAN and I. L. NARASIMHALU (*Cur. Sci. [India]*, 10 (1941), No. 6, pp. 290-291, figs. 2).

Physiologische Besonderheiten bei der Bildung der an Ustilago tritici erkrankten Weizenähre [Physiological peculiarities in the development of wheat ears infected with loose smut (U. tritici)], P. V. SABUROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 28 (1940), No. 3, pp. 270-273).

The wheat stem rust epidemic of Kansas in 1940, L. E. MELCHERS. (Kans. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1941, Supp. 132, pp. 95-103, pls. 4).—This survey considers crop conditions leading up to the epidemic of 1940, climatic conditions in Kansas as affecting stem rust development in that year, northward spread of infection, route followed in the survey, magnitude and types of losses, and varietal susceptibility to stem rust.

Disease resistance of Triticum timopheevi transferred to common winter wheat, R. G. SHANDS. (U. S. D. A. and Univ. Wis.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 709-712, fig. 1).—This paper briefly discusses the history of a hybrid with common wheat, its fertile progeny, and a few preliminary karyological observations. The results indicate that a number of the characters of *T. timopheevi*, including resistance to mildew, leaf rust, and stem rust, have been transferred to fertile types of common wheat and, furthermore, that several of these plant lines are fertile in hybrids with other wheat varieties.

The probability law in cotton seedling disease, K. S. CHESTER. (Okla. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 12, pp. 1078-1088, figs. 4).—In field and greenhouse, a mathematical analysis was made of the survival of cotton seedlings under various conditions of attack by *Glomerella gossypii*, *Fusarium moniliforme*, *Rhizoctonia solani*, and other seedling disease organisms, in an endeavor to find to what extent an infected seedling is hazardous to adjacent healthy seedlings. With freedom from serious *Rhizoctonia* attack, the mortality from infested seed followed a random distribution, agreeing with the distribution formula derived by expansion of the binomial equation. A skew distribution, with an excessive number of seedling failures in hills containing one or more infested seed, did not occur, indicating that in the absence of severe *Rhizoctonia*

attack diseased seedlings are not a hazard to adjacent healthy seedlings. This was confirmed by direct observations. Where *Rhizoctonia* was a factor, there was an excessive proportion of seedling failures in hills originally containing one or more diseased seedlings. These failures were not due to the "all-or-nothing" character of field accidents or to the original internal or external infestation of the seed but to soil-borne *Rhizoctonia* advancing in an all-or-nothing fashion. The findings agree with the greater usefulness of Ceresan seed treatments in the Southeastern States, where seed-borne infestations are of major importance in seedling disease, and the greater success of acid-delinting of seed in the Southwest where *Rhizoctonia* is the chief cause of seedling disease, since the acid treatment shortens the period of susceptibility to it. The bearings of these results on the planting value of partially infested cottonseed and on present needs in seed treatment are discussed.

The reaction of cotton varieties to Fusarium wilt and root-knot nematode, A. L. SMITH. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 12, pp. 1099-1107, figs. 3).—Preliminary observations indicate that the more important cotton varieties currently planted in the southeastern United States vary widely in root knot resistance. Resistance to root knot appears associated with wilt resistance, but this is believed to be incidental, since some wilt-resistant varieties show no more root knot resistance than wilt-susceptible and semiresistant varieties. Root knot resistance was confined to wilt-resistant varieties originated in lighter Coastal Plain soils, whereas none of the wilt-resistant varieties originating in the heavier sparsely root knot nematode-infested soils of Mississippi and Louisiana exhibited root knot resistance. Varieties combining root knot and wilt resistance are required for Coastal Plain conditions. These observations indicate that, while such combined resistance has been secured in some cases without conscious effort, it may be highly important for the breeder and pathologist to devote some attention to root knot resistance. A system of numerical evaluation of root knot infestation in cotton is described showing that it is possible to classify increasing root knot severity by increasing numbers, with 0 representing plants void of root knot galls and 1-4 representing percentages of roots infested at increments of 25 percent.

The carbon utilization and carbohydrase activity of *Phymatotrichum*, L. M. BLANK and P. J. TALLEY. (Tex. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 564-569).—Measuring the growth of *P. omnivorum* on different types of carbohydrates under controlled conditions, the amount was found to depend in some cases on whether sterilization was by autoclaving or by alcohol. Glucose, fructose, and mannose (or compounds from which the fungus could obtain these simple sugars) proved to be the best C sources. Utilization of polysaccharides was correlated with ability to hydrolyze them and the rates at which they were hydrolyzed.

Onion yellow dwarf—a virus disease of onions, F. P. McWHORTER (*Oregon Sta. Cir. Inform.* 233 (1941), pp. 3, figs. 2).—Directions are given for control of this disease, first found in western Oregon fields in 1940.

Results of testing some laboratory methods for possible use in the detection of virus diseases in potato tubers, D. FOLSOM (*Maine Sta. Bul.* 407 (1941), pp. [4]+83-104).—In the past the most reliable method of seed-tuber selection has necessitated planting sample eyes in the greenhouse or in a southern region and growing the resulting plants there. It is thus obvious that there would be advantages in rapid, practical, and dependable methods of testing tubers for virus diseases. In the large number of tests here reported, investigating possible correlations of some 20 tuber characters with different virus diseases, about 50 gave an average difference in respect to the measured character correlated with

chronic disease, and about 90 gave no average difference with chronic disease. Recent infection was correlated with an average difference in 3 instances, whereas in about 35 there was no consistent tuber difference associated with recent infection. Average differences were much more common with leaf roll and spindle tuber than with mild mosaic or rugose mosaic.

In comparisons with regard to parts of the tuber, skin toughness increased from stem to bud end, whereas there was a decrease in flesh hardness and resistance to alternating current. The two ends were the same with respect to refractive index. Flesh hardness was less in the cortex than in the center and was still less between. With decrease in tuber weight there were trends to less loss in weight absolutely but more in percentage, less of a percentage injured by cold, more of the severe type of freezing injury in one comparison and less in another, more resistance to alternating current, less current generated, higher pH, and more water absorbed. Therefore tuber weight must be considered in any kind of test. Tuber weight had no apparent correlation with skin toughness, flesh hardness, resistance to alternating current, or refractive index. The region in which the tubers were produced had an apparent effect on pH but none on resistance to alternating current. The part of the field producing the crop influenced the effect of cold, but conditions of storage did not affect flesh hardness or freezing injury though influencing the refractive index. There was a varietal difference in freezing injury, refractive index, and resistance to alternating current. Various other comparisons are detailed.

These various facts prove the necessity of standardizing any tests of this kind, even if they are as simple as are these, and of course the conclusions as to the effectiveness of the tests and as to the data on tuber characters may apply only to the conditions described for the particular tests reported upon.

There are 21 references.

The use of iodine in the control of potato ring rot and scab, P. A. ARK. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 10, pp. 954-956).—The spread of *Phytophthora septonica* infection by the seed-piece cutting knife was greatly reduced but not entirely prevented by dipping the knife in a 1 percent iodine solution. Treatment of the seed potatoes in this solution of iodine for 5 min. caused no injury to the "seed" and greatly reduced scab, but failed to control *Rhizoctonia solani* black scurf. For knife disinfection, an effective formula is said to be 38 gm. iodine, 76 gm. KI, 1 pt. glycerine, and 2 gal. water.

[**Papers on sugar beet pathology**] (*Amer. Soc. Sugar Beet Technol. Proc.*, [2] (1940), pt. 2, pp. 169-180, 191-240, figs. 2).—The following papers are of interest to phytopathology: Breeding for Resistance to Leaf Spot and Other Characters, by H. W. Dahlberg, A. C. Maxson, and H. E. Brewbaker (pp. 169-180); Further Studies of Sugar Beet Seed Ball Extracts With Special Reference to the Toxicity of Hydrolyzed Ammonia, by M. Stout and B. Tolman (p. 191) (U. S. D. A.); Resistance to *Fusarium* Yellows in Sugar Beets, by H. W. Bockstahler (pp. 191-198) (U. S. D. A. et al.); Effect of Mosaic Upon Yield of Seed by Sugar Beet Roots, by J. O. Gaskill (pp. 199-207), and Relation of 8-Inch and 16-Inch Spacing to Curly-Top Infection and Performances of Certain Curly-Top-Resistant Sugar Beet Varieties, by A. M. Murphy (p. 207) (both U. S. D. A.); *Verticillium* Wilt of Sugar Beet, by J. O. Gaskill and W. A. Kreutzer (pp. 207-208) (U. S. D. A. and Colo. Expt. Sta.); black root (pp. 208-213) and Boron Deficiency of Sugar Beets in the Puget Sound District of Washington (pp. 213-216), both by L. Campbell (Wash. Sta.); Soil and Seed Treatment Experiments With Sugar Beets for Control of Seedling Diseases (pp. 216-219), and Seedling Diseases, Phosphate Deficiency and *Fusarium* Yellows of Sugar Beets in the Rotations at the Huntley Field Station in Mon-

tana (pp. 219-223), both by M. M. Afanasiev (Mont. Sta.); *Aphanomyces* Root Rot of Sugar Beets as Influenced by Phosphate Application, by J. E. Kotila and G. H. Coons (pp. 223-225) (U. S. D. A.); 1939 Field Observations of Black Root Occurrence [in Sugar Beets], by M. W. Sergeant (pp. 226-228); [Sugar Beet] Root-Rot Survey 1938-39 Great Western Territory, by A. C. Maxson (pp. 228-229); and Borax as a Control for Heart Rot of Sugar Beets, by R. L. Cook (pp. 229-240) (Mich. Sta.)

A new leaf-spot resistant beet variety, G. H. COONS, D. STEWART, and J. O. GASKILL. (U. S. D. A.). (*Sugar [New York]*, 36 (1941), No. 7, pp. 30-33, figs. 2).—In this preliminary report, the release of a new leaf spot-resistant sugar beet variety, U. S. 215 × 216, expected to be more resistant and productive than European sorts and to be superior to the earlier introduction, is announced.

Changes in nitrogen and virus content of detached tobacco leaves in darkness, W. N. TAKAHASHI. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 12, pp. 1117-1122).—Detached mature Turkish tobacco leaves inoculated 4 weeks previously with tobacco mosaic virus (mosaic), healthy detached leaves inoculated immediately after detachment (mosaic-inoculated), and noninoculated healthy detached leaves were cultured in distilled water in darkness. The juice was expressed from the leaves, treated with trichloroacetic acid, and centrifuged. The changes in Kjeldahl N of the resulting precipitate and the supernatant liquid (soluble N) were followed during a 9-day culture period, and the remaining leaf residue was also analyzed for N. The changes in virus concentration were followed by the local lesion method on *Nicotiana glutinosa* half leaves. As the culture period progressed all three series showed a conspicuous increase in soluble N, largely at the expense of the leaf residue N, and increasing numbers of local lesions showed that virus increase had taken place under these conditions, particularly in the mosaic-inoculated series. Inclusion bodies in epidermal strips taken from mosaic leaves at the end of the test showed no signs of disintegration, indicating that these inclusions may not function as reserve protein and are not drawn upon by the starving host to support its respiration. Stream double refraction was exhibited by extracts from all mosaic leaves and 6-9 days' cultured mosaic-inoculated leaves, showing that prolonged dark culture does not greatly alter the form of the virus particles.

A distinctive strain of tobacco-mosaic virus from Plantago, F. O. HOLMES (*Phytopathology*, 31 (1941), No. 12, pp. 1089-1098, figs. 2).—A virus inducing mosaic in ribgrass (*P. lanceolata*) and in broad-leaved plantain (*P. major*) was found also to cause necrotic-ring patterns when inoculated into Turkish tobacco. Failure to inactivate it by heat (92° C. for 10 min.), its inability to form the characteristic necrotic primary lesions in tissues of *Nicotiana tabacum* or *N. sylvestris* already invaded by typical tobacco-mosaic virus, its precipitation by tobacco-mosaic-virus antiserum, and its response to the genic constitution of tobacco showed it to be a strain of tobacco-mosaic virus (*Marmor tabaci*). This ribgrass form, distinguished from previously known strains by its ability to form necrotic-ring lesions in tobacco, is named *M. tabaci plantaginis* n. var.

Synthesis of tobacco mosaic virus protein in relation to leaf chromoprotein and cell metabolism, M. W. WOODS and H. G. DUBUY. (Md. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 978-990, figs. 3).—HCN blocks a particular respiratory enzyme system ("A-system") and also blocks virus multiplication. Sufficiently prolonged N starvation brings on a reduction in activity of cyanide-sensitive respiration. Since virus multiplication depends on this respiration system, N starvation can thus prevent or retard it. A method is outlined for the quantitative extraction and separation of virus

protein and leaf chromoprotein, and previously undescribed properties of the latter are presented. Tobacco-mosaic protein synthesis closely parallels the synthesis of chromoprotein, and the data indicate that the virus may be formed from the same building units as the chromoprotein itself. The evidence suggests that tobacco-mosaic virus may be either an aberrant chondriosomal or chromoprotein derivative, or at least have a highly specific relationship to such proteins.

Resistance to the common mosaic disease of tobacco, E. E. CLAYTON and H. H. MCKINNEY. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 12, pp. 1140-1142, fig. 1).—From field tests of the practical merits of the Ambalema and glutinosa types of resistance to tobacco mosaic, it is concluded that under the tobacco-producing conditions prevailing in the United States the glutinosa type appears to have no practical value, since the prospects for achieving a completely localized necrotic reaction do not appear promising. On the other hand, the Ambalema type of resistance, after testing for 6 yr., has been maintained through numerous backcrosses, and it is predicted that tobacco varieties possessing Ambalema resistance will be introduced into cultivation in the near future.

Stomatal behavior in field tobacco, S. DIACHUN. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans.*, 9 (1941), No. 2, pp. 20-23).—Continuing the studies on relation to tobacco wildfire, *Bacterium tabacum* (= *Phytomonas tabaci*) (E. S. R., 83, p. 77), the data presented indicate that although the stomata on the leaves tend to be open during the day and closed at night, several modifying factors may upset this tendency. There is a close correlation between stomatal width and the rate at which leaves can be water-soaked. When stomata are open, leaves can be water-soaked very rapidly; when closed, very slowly or not at all.

Unrelatedness of tobacco-streak and potato yellow-dwarf viruses, W. C. PRICE and L. M. BLACK (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 594-595, fig. 1).—By means of cross protection tests to determine whether or not a close relationship (as claimed by some workers) exists between these two viruses, it was made apparent that plants thoroughly invaded by potato yellow dwarf virus, although protected from the severe strain, were not protected against infection with tobacco streak, and, conversely, plants thoroughly invaded by tobacco streak virus were not protected against the yellow dwarf virus. In each case, primary lesions and severe systemic infection resulted from the second inoculation. The data obtained demonstrate that these two viruses are not strains of one and the same virus and, in this sense, may be considered unrelated. It was also shown that neither virus is closely related to tobacco-mosaic, tobacco-necrosis, or tobacco-ring spot viruses.

A rosin-potash spreader for spraying hops for downy mildew control, G. R. HOERNER. (Coop. U. S. D. A.). (*Oregon Sta. Cir. Inform.* 236 (1941), pp. 2).—Directions are included on the preparation and use of a rosin-potash spreader recommended after trials of a large number over a 10-yr. period.

Pea varieties with pods resistant to *Ascochyta pisi* Lib., V. K. ZAZHURILLO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 4, pp. 351-352).—The reactions of plants v. pods of 20 pea varieties to *Ascochyta* blight are discussed and tabulated.

A leaf spot of peas (*Pisum* sp.) caused by *Cercospora lathyryna*, J. L. WEIMER. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 11, pp. 1031-1034, fig. 1).—A leaf spot of peas is reported and described as due to the same fungus as that causing a leaf spot of perennial sweet pea. It has been seen only at Experiment, Ga., on peas growing under a cloth shelter during late summer and early fall.

Fungi which cause pre-emergence injury to garden peas, G. T. S. BAYLIS (*Ann. Appl. Biol.*, 28 (1941), No. 3, pp. 210-218, pl. 1, figs. 2).—Examination of pea seedlings failing to emerge showed that attack had often occurred at a very early stage and frequently before germination. Various fungi were isolated from the cotyledons of diseased embryos, and *Pythium* spp. were obtained from almost every seedling axis. Of those tested, the *Pythium* and *Fusarium* species were the only ones found capable of inhibiting emergence in sterilized soil under conditions otherwise comparable to those in the field. The disease was attributed principally to *Pythium* spp., and such of the isolates as developed sexual organs were referable to *P. debaryanum* and *P. ultimum*. There are 20 references.

English pea yield more than doubled by seed treatment, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, p. 2).—This note reports damping-off and other rot organisms prevalent on certain heavy soils of Mississippi to have been successfully controlled, with resulting better stands and heavier yields, by seed treatments with organic mercurial and fixed copper dusts.

Root rot of pepper and pumpkin caused by *Phytophthora capsici*, C. M. TOMPKINS and C. M. TUCKER. (Calif. and Mo. Expt. Stas.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 7, pp. 417-426, figs. 3).—The inception and spread of this root rot of pepper and pumpkin plants, prevalent in the San Joaquin Valley, Calif., is definitely favored by excessive moisture, inadequate soil drainage, and high air temperatures. The root system and basal part of the stems of both hosts show a soft, wet decay, and permanent wilting of the leaves occurs very suddenly, with ultimate collapse of the stem and lodging and death of the plants. The isolates from both plants are described. Infection was obtained in the greenhouse by adding the fungus to the wet, autoclaved soil of potted plants. The incubation period was 6-14 days for pepper and 12-21 days for pumpkin. Successful cross inoculations were made with pepper isolates to pumpkin, and vice versa. In both hosts all isolates caused damping-off of seedlings in the greenhouse and rotting of fruits in the laboratory. These isolates of *P. capsici* also proved pathogenic to squash, eggplant, and tomato. No resistance was found in any of the varieties of pepper and pumpkin tested under greenhouse conditions.

Injury to tomatoes by lightning, O. C. WHIPPLE. (Univ. Wis.). (*Phytopathology*, 31 (1941), No. 11, pp. 1017-1022, figs. 3).—Lightning injury results in immediate death or collapse of the affected plant parts, and secondary changes follow rapidly. Since fields are often not visited for several days following an electrical storm, killed plants may be of little diagnostic value except that they show a prostrate condition. Plants mildly affected usually show certain characteristic symptoms, among the most conspicuous of which are collapse of the stem and drooping of the tops, various degrees of hollowing of the stem pith, collapse and desiccation of individual leaves of plants near the periphery of the "lightning spot," small longitudinal or circular stem lesions, irregular burnt areas on stems, leaves, and fruits, and blistering of the fruit surface and various degrees of cooking of underlying tissues.

Septoriose do tomateiro [Septoriosis of tomato], A. COSTA, JR. (*Ceres [Minas Geraes]*, 2 (1941), No. 11, pp. 395-413, pls. 4).—This is a general review and study of the disease and its distribution; its cause (*Septoria lycopersici*), including isolation, morphology and physiology, taxonomy, life history, ecology, and hosts; and its control by fungicides, culture practices, and resistant varieties. There are 15 references.

Studies on the bitter-pit disease of apples, O. R. BUTLER and S. DUNN (*New Hampshire Sta. Tech. Bul.* 78 (1941), pp. 10).—Though the exact cause of this apparently nonparasitic disease is not known, it seems to be modified considerably by fertilizer and other environmental factors, and there are notable differences in

varietal susceptibility, Baldwin and Northern Spy being most susceptible among the sorts grown in New Hampshire. As far as production was concerned, Ca, complete fertilizer, and K were not beneficial in the tests reported, P was of more value than K, and N and P were better than N and K. All things considered, there was no evidence that any fertilizer was better than N alone. For reduction of bitter pit, N and K were not as good as N and P. P reduced it, and K and N increased it. On the whole, the presence of S and P seemed to counteract the effects of N and K. K alone or with N should not be used. Ca seemed to be without effect except when N alone was used as fertilizer. In general, mulch kept the soil under it more moist, and nitrates in the soil were increased by it. There was no advantage for mulch in reducing bitter pit, but yields averaged somewhat better with it. Late harvesting aided in keeping down bitter pit development in storage.

New methods for scab control—is the new spray on the soil of value? K. J. KADOW and S. L. HOPPERSTEAD. (Univ. Del.). (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 170-179, figs. 2).—A progress report on ground spraying for apple scab (*Venturia inaequalis*) control.

Ozone in apple storage, R. M. SMOCK and R. D. WATSON. (Cornell Univ.). (*Refrig. Engin.*, 42 (1941), No. 2, pp. 97-101, figs. 3).—In the tests described, use of ozone materially reduced the mold spore count of apples in storage rooms and checked the spread of rots on scabby fruit significantly. The effect of ozone on reducing the ripening rate of apples is not clear but is in favor of the ozone treatment. More study is needed relative to the effect on scald of apples in storage.

Interstate cooperative experiments on field spraying of sour cherries, H. W. THURSTON, JR., C. F. TAYLOR, A. B. GROVES, and H. J. MILLER. (Pa., W. Va., and Va. Expt. Stas.). (*Phytopathology*, 31 (1941), No. 11, pp. 1047-1050).—The results of 1940 cooperative spray tests with some 13 fungicides against the *Coccomyces hiemalis* leaf spot, conducted in Virginia, West Virginia, and Pennsylvania, are tabulated and discussed. Bordeaux mixture and tank-mix copper phosphate were eliminated because of their effect on fruit size, lime sulfur and phenothiazine because of consistent failure to control leaf spot, and certain other materials because of their inconsistent effect on leaf retention. "ZO" and Basi-cop gave excellent leaf retention in the West Virginia test, where the leaf spot epidemic began comparatively late, but did not stand up under the heavier infections prevailing in the other two States. Had the test been run in West Virginia alone, one or more additional years would have been necessary to make this fact apparent. The added value of such cooperative tests thus becomes apparent.

The line pattern virosis of the genus Prunus, D. CATION. (Mich. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 1004-1010, figs. 4).—Abundance or Red June plums whose leaves appear normal for the variety and with little or no mottling or other symptom expressions may transmit a disease to peach trees expressed as a faint mottling of either line-pattern or diffused types. This disease is expressed similarly on Mahaleb cherry leaves. The line-pattern disease, *Marmor lineopictum* n. sp., was shown to be carried on certain Abundance and Red June plums in several Michigan orchards. It was present in certain Abundance plum nursery stock, and, from this and similar sources of distribution, it is thought to be perhaps widespread on plum trees. On peach the symptoms are apparently similar to certain ones first described by Valteau (E. S. R., 68, p. 211) and later by Thomas and Rawlins (E. S. R., 82, p. 640) as the Vacaville disease. A disease of Abundance plums, with symptoms resembling an unnamed plum disease described by Valteau and perhaps similar to a disease on plums described by

Thomas and Hildebrand (E. S. R., 77, p. 62) did not transmit noticeable symptoms to peach in three inoculations.

Fruit gumming of Victoria plums.—Progress report, III, W. B. ADAM and T. G. GILLESPIE (Univ. Bristol, *Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpt., 1940, pp. 43-47*).—Treatment with boric acid by branch injection or spraying gave a significant fall in the percentage of plums containing internal gum.

Anthraxnose of black raspberry (black caps) in Oregon, S. M. ZELLER (*Oregon Sta. Cir. Inform. 224 (1940), pp. 2*).—Notes on the disease and its control, with special reference to Oregon.

Las podredumbres radiculares del cafeto [Root rots of coffee], J. A. ALVARADO (*Café el Salvador, 11 (1941), No. 121, pp. 5-26, figs. 12*).—A general conspectus of the root rots of coffee and their control.

Relation of *Ceratostomella radicola* to rhizosis of the date palm, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Phytopathology, 31 (1941), No. 12, pp. 1123-1129, figs. 5*).—This potentially serious disease has been known in the Coachella Valley, Calif., since 1933. A reddish brown discoloration of the pinnae is followed within a few days by rapid wilting and death of the leaves, the disturbance commencing in the lower whorls and progressing upward. The fruit stalks wilt suddenly, and before all the older leaves have wilted the tightly folded young leaves at the center of the crown lose turgor and become whitish. Affected palms may die within 4-6 weeks. The roots become necrotic and filled with fungi at an early stage, but the trunk and leaves are free from fungus attack until the tree is badly wilted. Among several fungi isolated from the roots, *C. radicola* was the only one proving strongly pathogenic on potted seedlings. Although some of the nonwounded inoculated plants became infected, a high percentage of the wound-inoculated plants were killed within 20 days afterwards. The leaf bases and primary roots were decayed and blackened by the fungus. Green, nonwounded dates of the Deglet Noor variety were also attacked. It cannot be definitely stated that *C. radicola* is the cause of rhizosis, since many mature palms die suddenly with all its symptoms except the presence of this fungus in the roots. However, *C. radicola* is sometimes associated with rhizosis, and when inoculated into wounded seedling date palms it causes rapid necrosis.

Studies on *Septoria passiflorae* n. sp. occurring on passion fruit, with special reference to its parasitism and physiology, A. J. LOUW (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 229 (1941), pp. 51, pls. 4, figs. 11; Afrikaans abs., pp. 39-40*).

Smoulder of daffodils, W. C. MOORE (*Daffodil Year-Book, No. 11 (1940), pp. 33-36, pls. 3*).—Notes (including control measures) are presented on "smoulder" or gray mold due to *Botrytis narcissicola*, which is said to be now widely distributed in the British Isles.

Eelworm in seedling daffodils, C. H. EASTOP (*Daffodil Yearbook, No. 11 (1940), p. 31*).—A note on nematode infestation of 2-year-old seedlings in boxes which was successfully eliminated by 1-hr. hot-water treatment of the bulbs at 110° F. in a small electric sterilizer.

Verticillium wilt of strawflower, C. M. TOMPKINS and P. A. ARK. (Univ. Calif.). (*Phytopathology, 31 (1941), No. 12, pp. 1130-1134, figs. 3*).—This *Verticillium* wilt appears to be the chief limiting factor in the culture of strawflower (*Helichrysum bracteatum*) in California, other diseases, such as aster yellows and mildews, being minor in importance. The causal organism was identified as *V. albo-atrum*, a common soil inhabitant. Single-spore cultures readily segregated it into conidial and mycelial types. Young strawflower plants were readily infected in 4-5 weeks under greenhouse conditions. The fungus apparently is not

seed-borne. The strawflower isolates proved pathogenic for Acala cotton, egg-plant, tomato, and sunflower. The disease can be controlled by using clean soil.

A Fusarium wilt of sweet william (*Dianthus barbatus*), W. C. SNYDER. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 11, pp. 1054-1056, fig. 1).—In this wilt disease, found in the San Francisco region, affected plants become yellow and stunted, the leaves assume a leathery character, and the vascular systems of the roots and lower stem become browned. A basal stem rot may also be associated. Plants may die within a month after transplanting to infested soil. Since the causal *Fusarium* failed to infect carnation though agreeing morphologically with that form, it is described as *F. oxysporum* f. *dianthi* n. f.

Damping-off of longleaf pine, W. C. DAVIS. (U. S. D. A. et al.). (*Phytopathology*, 31 (1941), No. 11, pp. 1011-1016).—The persistent rosette habit of *Pinus palustris* seedlings leads to unusual damping-off symptoms. *Rhizoctonia* sp. has been most frequently isolated, but species of *Pythium* have not been recovered. Control is complicated by the lengthened period of susceptibility due to the rosette habit. Tests indicated that probably neither a presowing treatment of the soil with formaldehyde nor spraying with bordeaux or Cupro-cide will materially reduce late losses. Use of ferrous sulfate and o-phosphoric acid, separately or in combination at seeding time, reduced losses in some nurseries, but the most consistent chemical control was obtained by sprinkling the seedlings with Semesan. This should be done in late afternoon or on cool or cloudy days to avoid "burning." In most nurseries it seems likely that use of highly viable seed, combined with sowing in shallow rows to a depth of about $\frac{1}{4}$ in. with sawdust covering, or broadcast-sowing with firming of the soil and subsequently covering with sawdust, will afford the most practical control methods. Further, it appears that added protection from this hazard would be obtained by adopting weeding and cultivation practices that tend to keep the soil away from the seedling bases.

A root disease of Jeffrey and ponderosa pine reproduction, A. J. OLSON. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 12, pp. 1063-1077, figs. 3).—A disease of *Pinus jeffreyi* and *P. ponderosa* on a cutover forest area in Lassen County, Calif., hitherto of little economic importance, induces an infiltration of pitch in diseased roots and root collars and may ultimately result in the death of affected trees. Diseased trees always occur near old stumps, and affected root systems are in contact either with roots of the stumps or with diseased roots of other infected trees. The disease is shown to be spread by root contacts and to be due to a fungus described as *Cunninghamella meineckella* n. sp.

The relation of cultivated red currants to the white pine blister rust in New York State, W. H. SNELL (*Jour. Forestry*, 39 (1941), No. 10, pp. 859-867, fig. 1).—White pine blister rust control has involved complete removal of the cultivated European black currants and eradication of all other species of currants and gooseberries within 900 ft. of pine, except as this distance has been reduced or extended to meet unusual local conditions. Cultivated red currants have been eradicated along with the other species because there has been no available information as to how dangerous these plants are in proximity to pine, or at what distances from them they constitute a menace, if any at all. This paper shows that the literature generally agrees on the low degree of susceptibility of red currants and that it contains surprisingly few references to white pine infection originating from them. The main text of the paper presents observations and studies indicating that, in general, white pines even at very short distances from red currants are not infected with the blister rust, unless wild *Ribes* are at least as near to the pines as the red currants.

Willow blight in British Columbia, I. L. CONNERS, A. W. MCCALLUM, and J. E. BIER (*Phytopathology*, 31 (1941), No. 11, pp. 1056-1058, fig. 1).—Willow blight was discovered in British Columbia in 1940. *Physolepora miyabeana* was fruiting freely on the cankers, whereas *Fusicladium saliciperdum* was rare.

Control of the root-knot nematode by cultural practices, J. C. LE ROUX and F. J. STOFBERG (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 188 (1939), pp. 29, figs. 9).—The life history and symptoms induced by *Heterodera marioni* are described. In this work, infestations were effectively checked by starvation, eliminating all susceptible host plants. Following commercial control, only one susceptible annual crop can with safety be grown. Clean cultivation for periods of 9 and 12 mo. gave better control than the 6-mo. summer or the 6-mo. winter treatment.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on wildlife research and management] (*U. S. Dept. Int., Fish and Wildlife Serv., Wildlife Leaflets* 166 (1940), pp. 2; 167, pp. 2; 168, pp. 5; 169, pp. 4, fig. 1; 170, pp. 21; 171, pp. 8; 172, pp. 18, pl. 1; 173, pp. 10, pls. 2; 174, pp. 39; 175, pp. 11).—Further contributions in this series (E. S. R., 84, p. 212) are as follows: Nos. 166, Infectious Myxomatosis of Domestic Animals (Mosquito Disease; Big-Head Disease), by F. D. McKenney and E. L. Vail; 167, Grubs [*Wohlfahrtia vigil*] in Minks, by J. E. Shillinger; 168, The Digestibility of Animal Products and Cereals by Minks, by J. K. Loosli, S. E. Smith, and L. A. Maynard (coop. U. S. D. A. and Cornell Univ.); 169, Mink Breeding—Elementary Principles, by R. K. Enders (coop. U. S. D. A. et al.); 170, The Annual Fur Catch of the United States; 171, The Java Sparrow [*Padda oryzivora*], by P. Knappen; 172, Suggestions for Combating Objectionable Roosts of Birds, With Special Reference to Those of Starlings, by E. R. Kalmbach; 173, Fryer Rabbit Production, by G. S. Templeton; 174, Abstract of Fur Laws, 1940-41, by F. G. Grimes; and 175, Big-Game Inventory of the United States, 1939.

Methods for estimating populations of mammals, L. R. DICE (*Jour. Wildlife Mangt.*, 5 (1941) No. 4, pp. 398-407).

A technique for trapping and tagging spotted skunks, W. D. CRABB. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 4, pp. 371-374, pls. 4, figs. 5).

The intestinal phase of the resistance of rabbits to the larvae of *Taenia pisiformis*, A. B. and A. E. LEONARD (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 375-378).

The birds of North and Middle America, R. RIDGWAY and H. FRIEDMANN (*U. S. Natl. Mus. Bul.* 50 (1941), pt. 9, pp. IX+254, figs. 16).—This continuation of the descriptive catalog (E. S. R., 41, p. 547) takes up the families Gruidae (the cranes), Rallidae (rails, coots, and gallinules), Heliornithidae (sun grebes), and Eurypygiidae (the sun bitterns).

A field guide to western birds, R. T. PETERSON (*Boston: Houghton Mifflin Co.*, 1941, pp. XVIII+[2]+240, [pls. 46, figs. 40]; rev. in *Wilson Bul.*, 53 (1941), No. 3, pp. 203-204).—The review is by J. Moffitt.

Pondfish culture: A handbook on the culture of warm water game fishes of the United States, P. VIOSCA, JR. (*New Orleans: Pelican Pub. Co.*, [1937], pp. XXIII+260, [pl. 1], figs. 68).

Digestion in parasitic nematodes, I-III, W. P. ROGERS (*Jour. Helminthol.*, 18 (1940), No. 2-3, pp. 143-154, figs. 2; 19 (1941), No. 1-2, pp. 35-46, figs. 2; pp. 47-58, figs. 7).—Part 1 of this contribution deals with the digestion of carbohydrates (pp. 143-154), part 2 with the digestion of fats (pp. 35-46), and part 3 with the digestion of proteins (pp. 47-58).

The role of plastics in the field of entomology, D. B. WHELAN. (Univ. Nebr.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 3, pp. 73-84).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 669, 724-729, figs. 3).—Contributions presented (E. S. R., 86, p. 64) are: Mexican Bean Beetle in South Dakota, by N. P. Larson (p. 669) (S. Dak. State Col.); Type of Wire Screen Required for Excluding Cigarette Beetles and Tobacco Moths From Warehouses, by J. P. Vinzant and W. D. Reed (p. 724), and Hogshhead Construction as a Barrier to Stored-Tobacco Insects, by W. D. Reed, R. W. Brubaker, and H. N. Pollard (pp. 724-725) (both U. S. D. A.); Effects of Pyrethrins Upon Blowflies, by L. D. Anderson and R. A. Hook (pp. 725-726) (Ohio State Univ.); Control of Thrips [*Frankliniella occidentalis* (Perg.)] on Seedling Cotton, by J. R. Eyer and J. T. Medler (pp. 726-727) (N. Mex. Expt. Sta.); Toxicity to the Codling Moth Larva of Phenothiazine Prepared With Allotropic Forms of Sulfur, by E. H. Siegler and L. E. Smith (p. 727), and On the Causes [Tobacco Thrips] of Peanut "Pouts," by F. W. Poos (pp. 727-728) (both U. S. D. A.); and Effects of Infra-red Irradiation on the American Cockroach, by G. F. MacLeod (pp. 728-729) (Univ. Calif.).

[Contributions on economic insects] (*6. Cong. Internacl. Ent., Madrid, 1935* (1940), II, pp. 405-411, 535-543, 549-589, 657-667, 677-703, 713-727, 743-757, 781-802, 811-816, 831-890, 937-942, pls. 21, figs. 35).—Among the contributions presented are the following: The Classification of the Coleoptera and Post-Embryological Research, by K. Mansour (pp. 405-411); Locusts as an International Problem, by B. P. Uvarov (pp. 535-543); La lucha contra la mosca de las cerezas *Rhagoletis cerasi* (L.) Loew [Control of a Cherry Fruitfly], by M. Benloch and F. Domínguez (pp. 549-554); Utilisation des microbes dans la lutte contre les insectes nuisibles [Use of Microbes in the Combat of Noxious Insects], by S. and S. S. Metalnikov (pp. 555-566); Recent Advances in the Control of the Pink Boll-Worm (*Platyedra gossypiella*) by Natural Enemies, by M. Kamal (pp. 567-581); Las plagas del olivo en España [Insect Enemies of the Olive in Spain], by C. González de Andrés (pp. 583-589); Applicazioni della lotta artificiale e biologica per combattere qualcuno degli insetti più dannosi alla bieticoltura in Italia [Measures Employed in the Combat of Beet Insects in Italy], by C. Menozzi (pp. 657-667); La tensión superficial de las emulsiones en relación con su eficacia insecticida [The Surface Tension of Emulsions in Relation to Insecticidal Value], by S. Planes García (pp. 677-685); Experiencias de lucha contra la *Ceratitis capitata* con cazamoscas de vidrio [Experimental Work With Glass Bait Traps in Control of the Mediterranean Fruitfly], by F. Gómez Clemente (pp. 687-703); Experiencias de lucha contra la mosca del olivo (*Dacus oleae* Rossi) por medio de substancias atractivas [Experimental Work With Attractants for the Olive Fly], by R. Bohorquez (pp. 713-727); Introducción y difusión del *Aphelinus mali* (Hald.) en España [Introduction and Spread of *Aphelinus mali* in Spain], by J. Nonell Comas (pp. 743-750); Posibilidades de lucha biológica contra las orugas de la col [Possibilities of Biological Control of Cabbageworms], by P. Urquijo Landaluze (pp. 751-757); On the Use of Aeroplanes in Combatting Invading Swarms of the Red Locust [*Nomadacris septemfasciata* Serv.] With Arsenical Dust, by T. J. Naudé (pp. 781-796); Investigaciones sobre las orugas minadoras del maíz en Galicia (*Pyrausta nubilalis* Hbn. y *Sesamia vuteria* Stoll.) [Investigations of Corn Borers in Galicia], by P. Urquijo Landaluze (pp. 797-802); The Food-plants of *Nezara viridula* Linn. (Hem.: Pent.), by W. E. Hoffmann (pp. 811-816); The Cotton Leaf-Worm Problem in Egypt, by I. Bishara and M. S. El Zoheiry (pp. 831-843); Las plagas de langosta en España [The Grasshopper Plague in Spain], by J. del Cañizo (pp. 845-865); Controlling Insects From the Air—

A Review of Work Conducted in Canada, by A. Gibson (pp. 867-872); Survey of the Wood-Eating Insects in Government Buildings in Southern Sweden, by I. Trägårdh (pp. 873-878); On Some Aspects of Termite Damage in South Africa, by T. J. Naudé (pp. 879-886); Some Problems of Modern Forest Entomology, by I. Trägårdh (pp. 887-890); and The Problem of Races of *Anopheles quadrimaculatus* Say in the United States, by E. H. Hinman (pp. 937-942).

[Entomological investigations of the New Hampshire Station] (*New Hampshire Sta. Bul.* 330 (1941), pp. 30-31).—A progress report (E. S. R., 83, p. 796) by W. C. O'Kane, J. G. Conklin, L. C. Glover, and R. L. Blicke on studies on the penetration of ovicides and contact insecticides.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc.*, No. 37 (1941), pp. [1]+20).—Contributions presented (E. S. R., 83, p. 364) include: A Survey of the Rat Fleas of the Southern British Columbia Coast With Relation to Plague Studies, by G. P. Holland (pp. 1-5); Notes on the Life History of the June Beetle *Polyphylla perversa* Casey, by W. Downes and H. Andison (pp. 5-8); The Discovery of an Ixovotoxin in *Dermacentor andersoni* Eggs (Acarina: Ixodidae), by J. D. Gregson (pp. 9-10); Further Records of Siphonaptera for British Columbia, by G. P. Holland (pp. 10-14) (E. S. R., 83, p. 364); Ectoparasites of Birds and Mammals in British Columbia—VI, A Preliminary List of Parasitic Mites, by G. J. Spencer (pp. 14-18) (E. S. R., 83, p. 364); A Further Note on the Food Habits of the Brine Fly *Ephydra hians* Say, by I. J. Ward (p. 18) (E. S. R., 81, p. 672); A Preliminary List of the Species of *Culicoides* in Western Canada (Diptera: Ceratopogonidae), by L. C. Curtis (pp. 18-19); and Report on the Value of Plant Inspection in Relation to Pest and Disease Control in the Dominion of Canada, by H. F. Olds (pp. 19-20).

Insect and other pests of 1940, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 53 (1941), pp. 77-97, figs. 14).—A further report in this series (E. S. R., 83, p. 797).

Some injurious insects of agricultural plants and forest trees in Siam and Indo-China.—I, Aphididae, R. TAKAHASHI (*Formosa [Taiwan] Govt. Agr. Res. Inst. Rpt.* 78 (1941), pp. [1]+III+27, figs. 9).—This contribution lists 28 species from Siam and 4 from Indo-China, with biological notes on, or supplementary descriptions of, some of the species. Eight species and a variety are described as new.

Pests of rice, F. Q. OTANES and P. L. SISON (*Philippine Jour. Agr.*, 12 (1941), No. 2, pp. 211-261, pls. 18, fig. 1).—This account includes a list of 43 references to the literature.

Proceedings of the fifth annual Tobacco Insect Conference (*Ann. Tobacco Insect Conf. Proc.*, 5 (1941), pp. 20).—The proceedings of the Tobacco Insect Conference held at Oxford, N. C., July 22-24, 1941, are reported.

Important nursery insects of New Jersey, F. A. SORACI (*N. J. Dept. Agr. Cir.* 326 (1941), pp. 72, figs. 56).

Sulfur as a stomach insecticide, B. C. DICKINSON, C. M. MEADOWS, and E. D. WITMAN. (Ohio State Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 656-659, figs. 3).—Laboratory tests of commercial powdered sulfur applied as a spray or dust to foliage and ingested by last-instar larvae of several species of leaf-eating insects showed that sulfur may be lethal to the southern armyworm, variegated cutworm, and fall armyworm. It was not toxic at high doses to the catalpa sphinx, salt-marsh caterpillar, fall webworm, Mexican bean beetle, and the Colorado potato beetle. Lethal doses produced characteristic symptoms within a few hours, i. e., inactivation, constipation, and regurgitation, followed after death

by blackening of part of the body, which remained turgid. It is pointed out that the toxic action of commercial sulfur as a stomach insecticide is not understood. A few tests on special fractions of sulfur against the southern armyworm suggested the desirability of further investigations on relations among particle size, allotropic form, and toxicity of pure sulfur.

The relative toxicity of some 2,4-dinitro-6-R-phenols, J. F. KAGY. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 660-669, figs. 3).—Report is made of an investigation of the relative toxicity to several species of insects and mites of some 2,4-dinitro-6-R-phenols in which R represents a hydrogen or certain alkyl or alicyclic groups. While the chemistry of the 2,4-dinitro-6-R-phenols is very similar, the physical properties vary considerably. A review of the literature and the additional data presented led to the conclusion that 2,4-dinitrophenol is considerably less toxic to insects and mites than 3,5-dinitro-*o*-cresol (2,4-dinitro-6-methylphenol).

In the study of the compounds as stomach poisons, some relations of structure to toxicity are pointed out. "Petroleum oil solutions of 2,4-dinitro-6-cyclohexylphenol were more toxic than petroleum oil solutions of 3,5-dinitro-*o*-cresol to the San Jose scale (*Aspidiotus perniciosus* Comstock), to the bean aphid (*Aphis rumicis* L.), and to newly hatched larvae of the codling moth (*Carpocapsa pomonella* L.). The petroleum oil solutions of the two compounds were not significantly different, however, in their toxicity to eggs of *Lygaeus kalmii* Stål. Petroleum oil solutions of 2,4-dinitrophenol were much less toxic to eggs of *L. kalmii* than the solutions of 3,5-dinitro-*o*-cresol or 2,4-dinitro-6-cyclohexylphenol." An investigation concerned with the toxicity of some 2,4-dinitro-6-R-phenols in dust mixtures for the control of the citrus red mite (*Paratetranychus citri* (McG.)) is also reported. Certain literature relative to the pharmacology and toxicology of the 2,4-dinitro-6-R-phenols is reviewed.

Characteristics of different types of nicotine sprays, I, II (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 630-635, figs. 8; pp. 636-638).—This contribution is presented in two parts.

I. Nicotine residues, L. B. Norton and O. B. Billings (pp. 630-635) (N. Y. State Expt. Sta.).—In the work reported the residues from eight experimental nicotine sprays in the field were stripped from the apples, eliminating nicotine loss during transportation and making possible the securing of samples immediately after spraying. The findings show that the most rapid loss of nicotine normally occurs during drying of the spray. "The amounts of nicotine originally deposited by soluble nicotine and oil combinations are nearly as high as those by 'fixed' nictines. The fixed nictines lose only a small proportion of the original deposit during drying, while the soluble nictines may lose more than 75 percent during this period. Nicotine oleate and nicotine pectate yield a lower deposit at the same concentration than nicotine sulfate, probably because of run-off due to superior wetting properties. Nicotine oleate and nicotine pectate are lost from the fruit more rapidly and more completely than nicotine sulfate, probably because of lower chemical stability. Nicotine peat with rapeseed oil and nicotine bentonite without oil give about the same deposit and residue, while the nicotine peat with 1 pt. of blown rapeseed oil gives less, under the experimental conditions. Mineral oil and rapeseed oil show no apparent differences in either amount or permanence of deposit with nicotine sulfate or with nicotine oleate. The oil-nictines are less strongly affected by rain than the fixed nictines."

II. Codling moth control, R. Hansberry (pp. 636-638) (Cornell Univ.).—Report is made of the results of codling moth control work in the same orchard of 25-year-old Rhode Island Greening trees that was used in the nicotine residue studies noted above. The fruit in the preceding year had been 65-percent insect-

injured. A delayed dormant spray of oil-nicotine sulfate was followed by a pink calyx, and first cover spray of lead arsenate and lime-sulfur. Three cover sprays of the experimental materials were then applied on June 26, July 8, and July 19 for the first brood and a fourth on August 8-9 for the second brood. The findings, which include the percentage of injured fruit and total infestation and fruit drop for the several spray mixtures used, namely, petroleum oil-nicotine sulfate, petroleum oil-nicotine oleate, rapeseed oil-nicotine oleate, rapeseed oil-nicotine sulfate, rapeseed oil-nicotine peat, blown rapeseed oil-nicotine peat, nicotine pectate, and Black Leaf 155 Concentrate, are recorded in tables, but are regarded as tentative.

The use of petroleum oils as insecticides.—III, Oil deposit and the control of fruit tree leafroller and other apple pests, P. J. CHAPMAN, G. W. PEARCE, and A. W. AVENS. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 639-647, figs. 2).—Reporting further (E. S. R., 85, p. 503), data are presented which show the relation of oil deposits to insect control. A correlation was found to exist between the quantity of oil deposited on apple bark in spraying, as determined by the analysis of a sample of twigs, and the efficiency of the treatment in killing the eggs of the fruit tree leaf roller. "Expressed in terms of a surface unit, the minimum effective dosage required for this species is approximately 1.3 mg. oil per square inch of bark. This is the dosage when using the type of oil utilized in most of the tests reported. Greater or lesser amounts will be required for other petroleum oil types available. While oil deposition may be profoundly affected by the kind and amount of emulsifying agent used in the spray mixture, control was found rather directly related to the quantity of oil finally deposited regardless of how it became deposited. Thus there was little evidence obtained of any important effect on efficiency imparted by the emulsifier acting strictly in its role as a wetting and spreading agent. The dinitro insecticides used proved ineffective against the eggs of the leaf roller. These materials also failed to increase the efficiency of the treatment when combined with oil over that obtained separately with the oil.

"The fruit tree leaf roller egg parasite *Trichogrammatomyia tortricis* Girault was found to show essentially the same reaction to the various treatments tested as unparasitized eggs.

"Oil spray formulas advised for fruit tree leaf roller control should in most cases prove effective against the apple redbug. However, the data obtained suggest that approximately 1.5 mg. oil is the minimum effective deposit for this pest. The function of the emulsifier in wetting and spreading appears to constitute a more important factor in the control of the redbug than of leaf roller. The dinitro compounds gave negative results on redbug either when used alone or combined with oil. Dosages of oil found effective against the leaf roller and redbug proved ineffective against the rosy apple aphid in 1939 when the pest occurred in outbreak numbers in the experimental orchard. Control can eventually be effected with oil sprays containing a high percentage of oil, but it is doubtful that they would be acceptable treatments owing to the danger of tree injury at effective deposits. Between 3 and 4 mg. was the indicated minimum effective deposit per square inch of bark under infestation conditions obtaining in 1939."

Differentiation between toxic and suffocating effects of petroleum oils on larvae of the [northern] house mosquito (*Culex pipiens* L.) (Diptera), A. G. RICHARDS, JR. (*Amer. Ent. Soc. Trans.*, 67 (1941), No. 3, pp. 161-196, pls. 4).—Presented with a bibliography of 67 titles.

Present status of rotenone and rotenoids, R. C. ROARK. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 684-692).—This digest is presented with a list of 24 references to the literature cited.

Compatibility of bordeaux mixture and cube, R. A. FULTON and R. H. NELSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 647-649).—

Report is made of the results of combining ground cube root with bordeaux mixture, which has been under investigation in the laboratory and field. "In the laboratory, colorimetric and goldfish analyses indicated about a 20-percent reduction in the rotenone content of the mixture after 30 days. The reduction was about 40 percent after 62 days and 50 percent after 92 days, but no further change was detected even after 12 mo. In the field, a bordeaux-cube combination originally made up to contain 0.02 percent of rotenone, but which had deteriorated about 50 percent in rotenone content at the time of application, was tested against the Mexican bean beetle. The combination appeared equal in effectiveness and residual effect to a cube spray containing 0.015 percent of rotenone."

Experiments with several wetting agents in the removal of fluorine spray residue from apples sprayed with natural cryolite, E. H. KARR (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 676-684, figs. 2).—In experiments on the removal of fluorine spray residues from fruit sprayed with natural cryolite, wetting agents, including soap bark extract, Intramine-Y, Nekal BX, Vatsol, and Hydralene, were used in either the sodium silicate or the hydrochloric acid solution of a double process washing schedule. "The sodium silicate concentration was maintained at 9.6 percent by weight of the actual compound in the solution used for the first washing treatment. The hydrochloric acid concentration in the solution used for the second washing treatment was maintained at 1.5 percent actual HCl by weight. Every sample of fruit was exposed to each washing solution for 40 sec. at a temperature of 110° F. in a positive-control experimental fruit washer of a flotation type. The addition of either soap bark, Intramine-Y, Nekal BX, or Vatsol to the sodium silicate solution did not cause any particular change in the result obtained by the dual washing treatment. When Hydralene was added to the sodium silicate solution the effectiveness of the washing treatment was noticeably lowered. The addition of any one of the wetting agents to the hydrochloric acid solution reduced the effectiveness of the washing treatment. With the exception of soap bark, this reduction in effectiveness was considerable."

The use of fatty acids in insecticidal aerosols, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Science*, 94 (1941), No. 2445, pp. 444-445).

Application of the aerosol to fumigation.—I, Stabilization of a naphthalene aerosol, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 650-653, fig. 1).—In toxicity tests against the housefly made in the Peet-Grady chamber, naphthalene was vaporized both alone and in the presence of smoke from a burning mixture containing corn-starch and sodium nitrate. "The effective period of dispersed naphthalene was greatly lengthened by vaporization in the presence of the smoke. This increased effectiveness seems to be due to adsorption of the insecticide on the inert particles. The presence of the inert particles changes the character of the deposit and the rate of crystallization as well as the size of the crystal. Instead of being collected mostly on the floor, the naphthalene was deposited more uniformly on all surfaces regardless of position. The difference in mortality between the lots of flies exposed to naphthalene with and without smoke was greater in covered than in open cages."

Comparative efficiency of zinc sulfate and sugar solutions for the simultaneous flotation of coccidial oöcysts and helminth eggs, M. M. FARR and G. W. LUTERMOSER. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 417-424).—A study of the results obtained by a modified direct centrifugal flotation examination of soil and fecal samples containing known and unknown numbers

of eggs and oocysts of chicken parasites is reported upon. It is concluded that zinc sulfate solution of a specific gravity of 1.200 is a more efficient medium for the centrifugal flotation of oocysts of the chicken coccidia *Eimeria acervulina*, *E. mitis*, *E. maxima*, and *E. tenella* than a sugar solution of a specific gravity of 1.270. However, the zinc sulfate is less efficient for floating the eggs of *Ascaridia lineata* and *Heterakis gallinae*. Sugar solution of a specific gravity of about 1.200 is probably a more efficient medium for floating eggs, but zinc sulfate of the same specific gravity is probably more efficient for floating oocysts in simultaneous centrifugal floatations of the eggs and oocysts of the chicken parasites mentioned. Although sugar solution (sp. gr. 1.200) is no more efficient than zinc sulfate solution (sp. gr. 1.200), it is more practical for the detection of these poultry parasites because (1) it is more easily obtained than zinc sulfate, (2) it is less expensive, and (3) it is a better mounting medium. Because of the modified direct centrifugal flotation technic, from 10 to 88 percent of the eggs and oocysts inoculated into soil and fecal samples were recovered.

Thrips injury of peanut seedlings, G. M. SHEAR and L. I. MILLER. (Va. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), No. 19, pp. 470-474, pl. 1).—It is concluded that the so-called pouts disease of peanut seedlings results from the attack of thrips, of which the tobacco thrips and the flower thrips have been identified therewith. Tests made with tartar emetic-brown sugar spray have shown that it is not a satisfactory material for controlling the thrips on peanuts under field conditions.

Quantitative dietary studies on Phymata, W. V. BALDUF. (Univ. Ill.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 614-620).—In the dietary studies conducted, the details of which are tabulated, the predatory bug *P. pennsylvanica americana* Melin was used.

Breeding a potato resistant to the potato leafhopper, J. P. SLEESMAN and F. J. STEVENSON. (Ohio Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour.*, 18 (1941), No. 10, pp. 280-298).—A report of the nature and results of work under way since 1934, presented with a list of 13 citations.

Researches concerning Texas Tettigoniidae, F. B. ISELY (*Ecol. Monog.*, 11 (1941), No. 4, pp. 457-475, figs. 5).—The studies reported are accompanied by a list of 43 references to the literature cited.

Experimental transmission of the mosaic of *Canna indica*, G. O. OCFEMIA, I. S. MACASPAC and H. F. YUAN (*Philippine Agr.*, 30 (1941), No. 5, pp. 357-370, pls. 2).—It was found that the mosaic of *C. indica* can be transmitted to abacá by the cotton aphid and the corn leaf aphid, and that the cotton aphid can also transmit *C. indica* mosaic to *C. edulis* and two varieties of ornamental *Canna* species. Although the cotton aphid can transmit *C. indica* mosaic to varieties of ornamental *Canna* species and *C. edulis*, this aphid cannot transmit the mosaic of abacá to these plants. Neither can *Rhopalosiphum nymphaeae* (Linné) transmit abacá mosaic to ornamental *Canna* species and *C. edulis*. The cotton aphid can transmit *C. indica* mosaic to abacá seedlings after feeding for about 5 min. on diseased *C. indica*. Five cotton aphids are sufficient to effect transmission of *C. indica* mosaic to abacá seedlings. A virus-laden cotton aphid loses all of the virus when it feeds on the first plant. *C. indica* mosaic cannot be transmitted by *Aphis laburni* Kltb., *Pentalonia nigronervosa* Coq., and *R. nymphaeae*.

Butterflies: A handbook of the butterflies of the United States, complete for the region north of the Potomac and Ohio Rivers and east of the Dakotas, R. W. MACY and H. H. SHEPARD (*Minneapolis: Univ. Minn. Press*, [1941], pp. VII+247, pls. 4, figs. [52]).

An infestation of the pandora moth (*Coloradia pandora* Blake) in lodgepole pine in Colorado, N. D. WYGANT. (U. S. D. A.). (*Jour. Econ. Ent.*, 34

(1941), No. 5, pp. 697-702, fig. 1).—Report is made of general observations and limited studies in 1938 and 1939 of the life history and habits of the pandora moth in lodgepole pine on the Arapaho National Forest in north-central Colorado, where an infestation was discovered in August 1937. This moth has, as a rule, a 2-yr. life cycle, with a few individuals remaining in the pupal stage an extra year. The main emergence of the moths occurs in July of even years, with oviposition taking place very soon thereafter. The eggs hatch in about 40 days. The larvae pass through five stadiums, overwintering the first year in the second stadium on the twigs and attaining maturity the following July. They then pupate in cells in loose mineral soil at a depth of from 1 to 4 in., where they pass the second winter. The eggs form in the pupae in the spring, and the moths emerge in July. The epidemic had the aspects of becoming very serious until 1939, when natural control factors greatly reduced the population. There was at least a 50-percent mortality of the larvae during the winter of 1938-39, probably from low winter temperatures. A wilt disease killed approximately 60 percent of the remaining larvae in the fourth and fifth stadiums in June and July 1939. The affected larvae turned orange brown and their body contents became fluid. At the time the larvae were entering the soil, July 1939, approximately 43 percent of the remaining population were killed by the effects of heat and drought. Only one species of parasite, *Apanteles* sp., was reared. Bears and squirrels fed upon the pupae.

Concentrated spray applied with an autogiro for control of cankerworms, R. R. WHITTEN, S. F. POTTS, and E. H. FRANCIS. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 692-696, figs. 5).—The results of comparative tests on the control of the spring cankerworm and the fall cankerworm in the National Historical Park at Morristown, N. J., in which the applications were made with a specially equipped autogiro, are reported. The tests included the treatment of large woodland tracts with a concentrated spray mixture of lead arsenate, fish oil, paraffin oil, and water; a lead arsenate dust impregnated with paraffin oil; and a proprietary colloidal lead arsenate spray. For comparison certain areas were left untreated, and other areas were treated with a standard lead arsenate, fish oil, and water spray applied with a high-pressure outfit drawn by a truck. The results showed a marked reduction in the amount of feeding in the areas treated with the concentrated lead arsenate spray by means of the autogiro. This reduction is thought to be due to the improved coverage in the tops of the trees and to the improved adherence of the spray, apparently because of better atomization and an increased amount of fish oil per given quantity of lead arsenate. In all respects treatment by the autogiro compared favorably with that of the truck-drawn sprayer, and the cost per acre was less. Although measurable control was obtained in the area dusted with an autogiro, some difficulty was encountered in regulating the drift of the dust.

[**Codling moth control**] (*Vermont Sta. Bul.* 475 (1941), p. 35).—The results of studies to determine the periods of moth emergence and flight are briefly reported by M. B. Cummings and C. H. Blasberg.

Comparative injury by the European corn borer to open-pollinated and hybrid field corn, L. H. PATCH, G. W. STILL, B. A. APP, and C. A. CROOKS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 6, pp. 355-368, figs. 3).—Various strains of corn grown in Ohio from 1929 to 1933 were subjected to different known levels of borer population induced by placing egg masses on the plants by hand. Reduction in the marketable yield occurred through an increase in the number of earless plants and plants bearing unmarketable ears and through a reduction in the ear size on plants bearing marketable ears. Total reduction in marketable yield per acre per borer per plant was equivalent to the yield of

about 292 hybrid or open-pollinated plants bearing marketable ears in the absence of borers. Size of marketable ears was reduced about 2.5 percent per borer per plant in both the hybrids and the open-pollinated varieties. As compared with the absence of borers, the marketable yield of the hybrids was reduced 2.99 percent and that of open-pollinated varieties 3.64 percent per borer per plant. In the case of the hybrids the advantage was due to the difference in the rate of increase per borer per plant in the number of earless plants and plants bearing unmarketable ears per acre. Approximately 3.5 percent of the hybrid and 10.5 percent of the open-pollinated plants would have been broken below the ear in the absence of borers.

Hibernation of the corn earworm in southeastern Georgia, G. W. BARBER (*U. S. Dept. Agr., Tech. Bul. 791 (1941), pp. 17*).—Corn earworm hibernation was studied during the years 1930 to 1933, inclusive, in Chatham County. An average of 51 percent (range 30 to 80 percent) of the individuals that entered soil in cages to pupate during the fall survived the following spring. Larvae dug pupal burrows from less than 1 to more than 10 in. deep. Three types of emergence were noted—immediate, delayed within the current year, and delayed until the following year. Moths emerged from May 1 to July 23 in 1931, from April 2 to June 27 in 1932, and from April 18 to July 27 in 1933. The variation in depth to which larvae burrowed apparently enables the earworm to survive disasters that might befall the active stages above ground, since resting pupae were continuously present in the soil and moths emerged throughout the growing season. As few of the larvae that mature in early corn hibernate, it is concluded that if all field corn of an area could be planted early and be followed by crops that are not attractive as food plants for earworms, overwintering populations would be reduced, and a lowering of the level of population of the insect might result.

Some of the more important factors governing the flight of European corn borer moths to electric traps, G. A. FICHT and T. E. HENTON. (*Ind. Expt. Sta. coop. U. S. D. A.*). (*Jour. Econ. Ent., 34 (1941), No. 5, pp. 599-604*).—The basic results secured from studies on some of the more important factors influencing the flight of European corn borer moths to electric traps, here reported, have shown that the moths prefer certain color bands of the visible spectrum. The violet-blue band proved the most attractive. "In a comparison of H-4 and CX lamps it was found that the H-4 lamp, from which the percentage of over-all input radiated in the violet and blue spectral bands was approximately 4 times the percentage of these colors radiated by the CX lamp, attracted approximately 10 times as many moths as did the CX lamp. Ultraviolet radiation below 3,200 angstroms did not add to the attractiveness of lamps as a lure for corn borer moths, and the moths showed no preference for lamps radiating ultraviolet energy of 2,967 a. u. The size of the luminous area is of some importance in attracting the moths. An increase in the ratio of the size of the luminous area from 1 to 8 times increased the attractiveness of the radiant energy source approximately 5 times. The intensity of the source of the radiant energy in the region visible to the naked eye is an important factor affecting the attractiveness of lamps to the European corn borer. The number of moths attracted to the radiant energy was in almost direct proportion to the intensity of light visible to the human eye. Field studies indicated that the corn borer moths showed a preference for those traps which were placed on the high spots of the field when corn heights were about equal. Moths were captured in the greatest numbers when the traps were operated just above the level of the corn. No significant difference was noted in catches from four types of traps having differently shaped electrocutor grids."

Practical control of the European corn borer, N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Conn. Veg. Growers' Assoc. Rpt., 1940, pp. 65-66*).—Brief report is made of an experiment which shows that dusting early corn is highly profitable and commercially feasible.

Histochemical detection of glycogen in blood cells of the southern armyworm (Prodenia eridania) and in other tissues, especially midgut epithelium, J. F. YEAGER and S. C. MUNSON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 5, pp. 257-294, pls. 14, figs. 3*).—Glycogen may appear normally in the blood cells, midgut epithelial cells, and certain other tissues of southern armyworm larvae, but it does not occur in blood or midgut cells at the time of hatching. Glycogen indices demonstrate that blood-cell glycogen increases during normal larval development to attain a maximum in the prepupa; after pupation it rapidly decreases and remains at a low level during most of the pupal period, at the end of which it tends to disappear. Blood-cell glycogen occurs infrequently in the first instar and probably in the adult. When newly hatched larvae are starved, neither blood-cell nor midgut-cell glycogen appears up to death, but when given food with sufficient carbohydrate, particularly glucose, glycogen occurs, appearing sooner in midgut than in blood cells. Blood-cell glycogen decreases or disappears during starvation and increases after intake of food containing carbohydrate, when 85 percent of the blood cells may contain glycogen inclusions. Most of the blood-cell types, particularly the plasmotocytes and cystocytes, may contain glycogen inclusions under these circumstances. These inclusions tend to be fewer and larger in the plasmotocytes than in the cystocytes and may occur in cells undergoing mitosis. The average glycogen counts from nonligatured larvae and from the anterior and posterior portions of ligatured larvae have similar forms. Polysaccharide occurs in the following tissues of larvae fed a high carbohydrate diet: Ganglia and connectives of the ventral nerve cord, labial glands, Malpighian tubes, fat body, oenocytes, gonads, pericardial cells, integument, foregut and hind-gut walls, and striated fibers of body, gut, cardiac, and alary muscles.

It is concluded that the southern armyworm is not exceptional in possessing blood-cell glycogen. This glycogen represents storage rather than transportation of foodstuff; therefore, carbohydrate storage is one function of these blood cells. The blood cells possess mechanisms for synthesis and hydrolysis of glycogen. Midgut-cell glycogen indicates storage of reserve carbohydrate rather than a glucose-absorbing mechanism. Although the fat body may store the largest amount of glycogen, glycogen synthesis also occurs in other tissues where glycogen is found. Stored glycogen probably occurs in both soluble and relatively insoluble form.

Culex quinquefasciatus, a new vector of Plasmodium gallinaceum, L. VARGAS and E. BELTRÁN (*Science, 94 (1941), No. 2443, pp. 389-390*).—A southern house mosquito that fed upon a chicken infected with *P. gallinaceum* and was kept at ordinary laboratory temperatures approximating 20°-25° C. was found to contain sporozoites in its salivary glands upon dissection 29 days later.

The mosquitoes of Arkansas, S. J. CARPENTER (*Little Rock, Ark.: State Bd. Health, 1941, pp. 87, pls. 15*).—A revised edition (E. S. R., 84, p. 85).

New western Dolichopodidae (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Jour. Kans. Ent. Soc., 14 (1941), No. 3, pp. 92-97, figs. 8*).—Two species of the genus *Dolichopus* and one each of *Medeterus* and *Polymedon* are described as new.

The transmission of anaplasmosis by horseflies (Tabanidae), D. E. HOWELL, C. E. SANBORN, L. E. ROZEBOOM, G. W. STILES, and L. H. MOE (*Oklahoma Sta. Tech. Bul. 11 (1941), pp. 23*).—Epidemiological evidence indicates

that horseflies may be important in the transmission of anaplasmosis. Bites of flies just fed on clinical or carrier cases of anaplasmosis will transfer the disease to healthy animals. Fewer bites are necessary if the infecting animal is in the acute stage of the disease than if it is a carrier. Bites obtained 5 min. or more after the infective feed were not effective. Seven species of *Tabanus* transmitted the disease. It is concluded that horseflies may be important vectors of anaplasmosis among animals in the same herd, but can have little influence on the spread of the disease to animals more than a short distance away.

The Amazon fly under drought conditions in British Guiana, L. D. CLEARE (*Trop. Agr. [Trinidad]*, 18 (1941), No. 7, pp. 131-134).—A comparison of surveys of the Amazon fly made in British Guiana in 1937-38 and 1939-40 indicates that it has maintained its position as a parasite of the sugarcane borer since its introduction into that country in 1933. The prolonged drought that occurred from August 1939 to April 1940, during which the rainfall in the localities examined ranged between 12.75 and 18.38 in., did not affect the status of the fly as a parasite of the borer, and it is considered evident that under British Guiana conditions at least it can adapt itself to such prolonged dry periods.

Some biological observations of the adults of the apple maggot and the cherry fruitflies, W. W. MIDDLEKAUFF. (Cornell Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 621-624, figs. 3).—The work reported relates to the weights of 24-hr. *Rhagoletis* adults, aphid honeydew as food for the apple maggot, parasites from *Rhagoletis* puparia, and tests for the presence of tarsal chemoreceptors. The hymenopterous parasites recorded from puparia of the three *Rhagoletis* species are (1) from *R. pomonella* (Walsh), *Opius lectus* Gah., *O. ferrugineus* Gah., *Aphaereta muscae* Ashm., *Galesus* n. sp., and Eulophidae sp.; (2) from *R. cingulata* (Loew), *O. ferrugineus*; and (3) from *R. fausta* (O. S.), *Opius* sp. (*lectus-lectoides* complex), *Pachycrepoideus dubius* Ashm., and *Eucoila* sp. In the feeding experiment in which aphid honeydew was used as food five females survived from 7 to 29 days, with an average of 21.6, and five males survived from 23 to 42 days, with an average of 29.8. Controls supplied with water alone were all dead within 5 days. Controls fed yeast and honey and held in 6 by 6 by 6-in. cages survived an average of 40 days and a maximum of 92 days.

Toxicological studies with adults of apple maggot and cherry fruitflies, W. W. MIDDLEKAUFF and R. HANSBERRY. (Cornell Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 625-630, figs. 4).—Methods of obtaining pupae and of rearing and feeding the adults of the apple maggot, black cherry fruitfly, and cherry fruitfly are described. "The median lethal doses of trisodium arsenite and trisodium arsenate were calculated for these species by a technic whereby the individual flies were fed on solutions, dosage being determined by weight differences. No differences in the toxicities of trivalent and pentavalent arsenic were noted. The median lethal dose of trisodium arsenite and trisodium arsenate for the apple maggot was 0.10 and 0.09 mg. metallic As per gram of body weight, respectively, as compared to 0.08 and 0.07 mg./gm. for *Rhagoletis cingulata*. The median lethal dose of trisodium arsenate for *R. fausta* was 0.07 mg. As/gm. The most toxic substance tested, Reinecke salt, gave a median lethal dose of 0.0079 mg./gm. Compounds of nicotine, although decidedly toxic in cage tests, were generally too repellent or too emetic in individual tests to be effective. Nicotine alkaloid was repellent at the lowest concentration used, 0.0156 mg./cc. No correlation between solubility of the nicotine compounds and repellency could be noted. In laboratory cage tests, calcium arsenate always killed more quickly than lead arsenate, and again the cherry fruitflies were more susceptible to the arsenicals than was the apple maggot. Seven days were necessary to obtain

50-percent mortality of apple maggots caged with no other food than apples sprayed with lead arsenate in 20 percent sucrose."

Observations on the natural control of sheep blowflies in South Africa.—**I, Predatory wasps of the genus *Bembix*, Fabr., G. C. ULLYETT and A. H. DE VRIES** (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 224* (1940), pp. 23, figs. 8).—Studies of the life history and habits of *B. olivata* Dahlb. and *B. capensis* Lep. have led to the conclusion that while *Bembix* wasps play an important role in the natural control of blowflies any attempt to increase their effectiveness by rearing and liberations would not be successful.

The detection of poliomyelitis virus in flies, J. R. PAUL, J. D. TRASK, M. B. BISHOP, J. L. MELNICK, and A. E. CASEY. (La. State Univ. et al.). (*Science, 94* (1941), No. 2443, pp. 395-396).—Two instances are described in which the virus of poliomyelitis was detected in collections of flies made in the field during epidemics of infantile paralysis. The first positive test was obtained from a summer camp in Connecticut and resulted from the inoculation of monkeys with an emulsion composite of from 1,000 to 1,200 flies representing a number of species. The second infection was obtained from the inoculation of a sample of flies obtained in the vicinity of Jasper, Ala., where the disease was epidemic in the summer of 1941.

Venezuelan diptera, I, J. R. MALLOCH (*Bol. Soc. Venez. Cien. Nat., 7* (1941), No. 48, pp. 123-131, figs. 3).—A new trypetid genus *Neorhabdochaeta*, of which *N. anduzei* n. sp. is a genotype, is erected and three new varieties of the sapromyzid genus *Setulina* are described.

A comparative study of rodent and burrow flea populations, M. A. STEWART and F. C. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 47* (1941), No. 1, pp. 140-142, figs. 2).

A preliminary report on control of the western twelve-spotted cucumber beetle in orchards, A. E. MICHELbacher, G. F. MACLEOD, and R. F. SMITH. (Univ. Calif.). (*Jour. Econ. Ent., 34* (1941), No. 5, pp. 709-716, figs. 3).—Control work is reported with the western spotted cucumber beetle, which for a number of years has been known to be a serious pest of ripening deciduous fruits in several localities in California due to the damage caused by direct feeding and through the large losses that have resulted from the spreading of the brown rot organism. Infestations of the beetles apparently arise from migrations of the pest from outside of the orchards, trees with dense foliage being preferred as feeding places. In the Brentwood area of California, where in 1938 the losses were so great that an investigation was asked for, the highest populations in 1940 were encountered in the fringe of orchards adjacent to the uncultivated land. In some orchards that year the peak population per tree exceeded 700 beetles. Since the beetles do not feed to any extent on green fruit, control measures are necessary only during the ripening period. "The most effective dusts used contain pyrethrum. A pyrethrum dust to be effective must have either some special solvent added or be used with some materials such as Lethane. Effective dusts used had pyrethrin contents of 0.1 to 0.2 percent and contained 1 or 2 percent Lethane or special solvent. To insure good control, a dust should be applied at the rate of about 50 lb. to the acre. The temperature should not be higher than 63° F., and if there is any drift it should be into the area already treated. A drift into the nondusted portion of an orchard will knock the beetles from the trees with a sublethal dosage. Under ideal conditions, mortalities of from 90 to nearly 100 percent can be expected. For satisfactory control, as many as two dustings may be necessary."

Resistance of corn strains to the southern corn rootworm (*Diabrotica duodecimpunctata* F.), J. H. BIGGER, R. O. SNELLING, and R. A. BLANCHARD.

(Ill. Expt. Sta. coop. U. S. D. A. and Ill. Nat. Hist. Survey). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 605-613, figs. 3).—Infestation by the southern corn rootworm caused increases in lodging of the plants, in the moisture content of the ears at harvest, and in the proportion of poorly filled ears and unsound corn. The resistance of corn strains to larval attack was measured in the experiments conducted by their resistance to root lodging on soil known to be infested with the insects. Lodging data obtained on inbred lines and single crosses during a 3-yr. period in several localities in Illinois indicate a differential response of the plants to larval attack. The Indiana inbred line 38-11 was outstanding in its resistance to lodging following rootworm attack either as an inbred line or in hybrid combinations. Some inbred lines suffered markedly less leaf injury from the feeding activity of the adult insects than other lines grown in the same experiment. The resistance to the injury caused by the southern corn rootworm is shown to be heritable. The development and use of resistant strains appears to be the only practical method of reducing the damage.

Winter survival of the prairie grain wireworm at different soil depths, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, p. 3).—The results of overwintering studies indicated that prairie grain wireworm (*Ludius aereipennis destructor* Brown) larvae may overwinter equally well at depths from 3 to 21 in. in the soil.

Wireworm populations as related to potato tuber injury, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, p. 4).—It appears that an average population of one wireworm per cubic foot of soil is able to cause nearly 43 percent tuber injury to potatoes.

The revival of cigarette beetle larvae fumigated with hydrocyanic acid, E. M. LIVINGSTONE and W. D. REED. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 653-656).—Following a review of earlier work, with references to the literature, report is made of observations of the revival of cigarette beetle larvae after fumigation with various concentrations of hydrocyanic acid gas for different exposure periods, the details being presented in a table. Full-grown larvae were exposed to concentrations of 5, 10, and 15 mg. per liter for 1, 2, and 3 hr. For each exposure period there was a gradual decrease in larval revival as the concentration of the gas increased, and for each concentration of gas there was a gradual decrease in revival as the length of exposure increased. Larval revival increased gradually from day to day until the point of maximum revival was reached, and after that there appeared to be little or no relation between revival and time following fumigation.

Progress report on studies of *Hypera brunneipennis* (Boh.) in the Yuma Valley of Arizona, W. C. McDUFFIE (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1941, E-551, pp. 20, pl. 1).

Cold hardiness of two species of bark beetles in California forests, J. S. YUILL. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 702-709, figs. 6).—The results of a 4-yr. study on the effect of low temperatures on the larvae of two of the principal timber-killing bark beetles of the California region, the western pine beetle and the mountain pine beetle, are reported. In the course of this work 60 tests were conducted in which over 25,000 larvae were subjected to various temperature conditions. In California overwintering larvae of the western pine beetle are killed by a temperature range of 5° to -7.5° F. and those of the mountain pine beetle by a range of 15° to -12.5°. Prolonged exposures increase mortality in the upper critical range, but as the temperature is reduced the intensity of the cold (temperature point) becomes the governing factor rather than the length of the exposure. Cold hardiness varies with the season. With larvae of the western pine beetle the difference between the sum-

mer state and the winter state is relatively small, and the change from the former to the latter takes place in a comparatively short time. With larvae of the mountain pine beetle the resistance gradually increases as the season becomes cooler and covers a wider range than does that of the other species. Larvae of the mountain pine beetle show a pronounced difference in cold hardness when developing in different hosts. Those from lodgepole and ponderosa are more resistant than those from sugar pine. In the northeastern portion of the State cold waves of such intensity occasionally occur that overwintering broods of the western pine beetle are reduced by as much as 65 percent. In other areas the winter mortality is never extensive. Mountain pine beetle larvae are rarely, if ever, killed by winter temperatures in the California region. The consideration of winter mortality in planning control operations is discussed.

The occurrence in Kansas of the sugar-cane rootstock weevil *Anacetrinus deplanatus* Csy. (Coleoptera: Curculionidae), H. R. BRYSON. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 3, pp. 84-90, pl. 1).—It is pointed out that *A. deplanatus*, a sugarcane rootstock weevil found attacking sorghum in Kansas, may become a pest of importance due to the manner in which it attacks the plant and the amount of injury that one larva can cause.

Observations on the purported resistance of the honeybee to American foulbrood, J. E. ECKERT. (Univ. Calif.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 720-723).—Data from fall and spring examinations of combs for symptoms of foulbrood are presented in tables. It is concluded that, until more dependably resistant strains of bees can be produced through years of careful selection and breeding, beekeepers should not pin their faith on this way to solve their disease problem, but should continue to eliminate all traces of American foulbrood by burning diseased colonies as soon as discovered.

Electric heating of beehives.—Preliminary report, E. B. WEDMORE (*London: Brit. Elect. and Allied Indus. Res. Assoc.*, 1941, pp. [1]+19+[5], figs. 5).

A 10-year summary of honeyflow records, O. W. PARK. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 394-400).

Some characteristics of the oriental honeybee *Apis indica* F. in China, C. R. KELLOGG (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 717-719).—This contribution relates to *A. indica*, found throughout Japan, China, India, the Philippine Islands, Indo-China, and the Malay region. Until the recent introduction of the honeybee from abroad, it was the main source of honey there, and it is still the main source of honey for local consumption in China.

A new species of the *Eurytoma rhois* complex from the seeds of *Schmaltzia* (*Rhus*) *trilobata* (Eurytomidae), R. E. BUGBEE. (Kans. State Col.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 3, pp. 98-102, figs. 6).—Under the name *E. seminis*, a eurytomid infesting the seeds of *S. (Rhus) trilobata* in Kansas and Oklahoma is described as new. Brief notes on the biology of this hymenopteron are included.

The diapause and related phenomena in *Gilpinia polytoma* (Hartig), I, II, M. L. PREBBLE (*Canad. Jour. Res.*, 19 (1941), No. 10, Sect. D, pp. 295-322, figs. 3; pp. 323-346, figs. 2).—The first two of five contributions.

I. Factors influencing the inception of diapause (pp. 295-322).—This includes a review of the literature on diapause and an outline of the life cycle of the European spruce sawfly in Canada, especially the developmental stages within the cocoon. In studies of factors influencing the inception of diapause, evidence has been secured from offspring of stock from one-generation and two-generation areas that there are genetic differences within the species with respect to the capacity for development without diapause. Environmental factors are capable of bringing on diapause, and such factors are obviously

operative during the development of the last seasonal generation of "emergent" field populations. However, analysis of weather conditions and incidence of diapause in such field populations failed to indicate correlation between the degree of diapause and any one environmental factor. A list of 85 references to the literature is included.

II. Factors influencing the breaking of diapause (pp. 323-346).—Field and laboratory experiments conducted have shown the importance of a period of "cold-rest" at a temperature below the threshold of development as a requirement for overcoming diapause in the spruce sawfly, especially in stock from a one-generation area. After cold-rest, maximal development results at a temperature of from 74° to 75° F. or higher and after contact with water. Temperatures in the field are lower and fail to promote as high development as may be obtained in the laboratory. However, temperature variations between 65° and 45° evidently have little influence on the degree of emergence from the diapause condition, though speed of development is directly affected. The benefit of contact with water is reduced or lost if contact occurs only while soil temperature remains below the threshold of development, and if the moisture taken up in the cocoon wall is lost by evaporation before it can be absorbed by the larva. The role of the cocoon in water exchanges and differential effects of abnormal weather conditions upon intracocoon development in stocks in one-generation and two-generation areas are described.

Ornithodoros parkeri Cooley: Observations on the biology of this tick, G. E. DAVIS (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 425-433).

Ornithodoros hermsi and relapsing fever in Oregon, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 41, pp. 2010-2012).

Examinations of wild animals for the cattle tick *Boophilus annulatus microplus* (Can.) in Florida, B. V. TRAVIS. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 465-467).—The results of tick collections in the wild from four species of birds and nine species of mammals, made largely during the months of November to February, inclusive, in ticky areas of Orange, Osceola, and Collier Counties, Fla., are tabulated. Additional species of birds and species of mammals were examined, and no ticks found upon them.

The control of slugs by meta bait in Trinidad, B. W. I., E. M. CALLAN (*Trop. Agr. [Trinidad]*, 18 (1941), No. 11, pp. 211-213).—A bait consisting of a 2-percent mixture by weight of meta fuel, the main if not the only constituent of which is metaldehyde, a polymerized form of acetaldehyde, is extremely attractive and toxic to the slug *Vaginulus langsdorfi* Férussac but ineffective against the changa. Applied in small heaps at the rate of 10 lb. of bait per acre, it proved effective in killing large numbers of slugs. Meta wheat bran bait proved to be more effective than meta baits with either rice bran or coconut meal as diluents, although, on a basis of cost, meta rice bran bait actually killed more slugs per dollar. Meta corn meal bait proved effective. Meta bait appears to retain its toxicity for about a week under Trinidad conditions. The cost of treatment varied from 53 to 78 ct. per acre, depending on the diluent used.

***Haemonchus contortus* eggs: Comparison of those in utero with those recovered from feces and a statistical method for identifying *H. contortus* eggs in mixed infections**, J. H. TETLEY (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 453-463, figs. 8).

Spicule length in *Cooperia curticei* as a measure of favorable intestinal environment for this intestinal nematode of sheep, J. H. TETLEY (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 449-452).

ANIMAL PRODUCTION

War-time stock feeding—some investigations and lessons therefrom, W. G. R. PATERSON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 53 (1941), pp. 26-48).—Results are presented of comparisons of silage and concentrates for beef and milk production, use of straw treated with caustic soda for beef production, and feed consumption of different breeds of sheep.

A method of determining range forage utilization by sheep, J. T. CASSADY (*Jour. Forestry*, 39 (1941), No. 8, pp. 667-671, figs. 2).—A description is given of a method for determining range forage utilization based on the percentage of the plants and parts of each species present before and after grazing. Each plant is arbitrarily divided into "units."

Recent work on the wool zoology of the New Zealand Romney, F. W. DRY (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 4A, pp. 209A-220A).—Recent developments and findings on inheritance of wool fiber character, halo-hair abundance, and kemp in the fleece of the New Zealand Romney are reviewed. Reference is made to the operation of multifactors in the halo-hair abundance and the relation to horn characters.

Swine feeding investigations, 1936 to 1940, C. E. AUBEL (*Kansas Sta. Cir.* 207 (1941), pp. 20, fig. 1).—A series of swine feeding experiments conducted from 1936 to 1940 deals with the relative value of the protein supplements and mixtures, corn v. blackstrap molasses for fattening pigs in dry lot on alfalfa pasture, and self-feeding and hand-feeding of sows with their litters. In general, peanut meal, soybean meal, and fish meal with minerals made satisfactory substitutes for tankage in the corn ration, but the amounts of feed required per unit of gain were often greater. Molasses successfully replaced corn, but feed costs were greater. Hand-feeding produced pork at a slightly more economical feed requirement than self-feeding.

The vitamin D requirements of the growing pig, B. J. SENIOR (*Roy. Dublin Soc. Sci. Proc.*, n. ser., 22 (1941), No. 38, pp. 379-385).—The potency of excess vitamin D in compensating a variable Ca:P ratio in the ration of pigs was demonstrated. The serum Ca was maintained at a relatively uniform level of from 10 to 11 mg. per 100 cc. on rations containing Ca:P ratios of 0.5 to 2, if adequate amounts of vitamin D were supplied by cod-liver oil and ample direct sunlight. In two experiments the sources of vitamin D were limited, and rickets developed in from 20 to 131 days.

The causes of stillbirth in swine and an attempt to control it, S. A. ASDELL and J. P. WILLMAN. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 6, pp. 345-353, fig. 1).—Among 1,882 pigs of three breeds born at the station from 1930 to 1935, 125 were dead. Study of the occurrence of stillbirths showed that disproportionate organ weights and pathological conditions seemed to be the principal contributory factors to the 6.6 percent of stillbirths. A considerable number of still-born pigs had attempted to breathe but had been smothered. Being born late in the farrowing seemed conducive to stillbirths. Tabulation showed that still-born pigs were more frequent in large litters, in the litters of old sows, and in spring litters than in small litters, in litters of young sows, and in fall litters, respectively. Hastening birth with pituitrin gave dubious results as to effects on stillbirths.

Effect of temperature and humidity on colour of lean and development of rancidity in the fat of pork during frozen storage, W. H. COOK and W. H. WHITE (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. D, pp. 53-60).—Storage of prime pork cuts in desiccators at temperatures ranging from -6.6° to -23° C. for 48 weeks showed that storage temperature was the primary factor affecting color. Samples that exhibited the greatest color change in storage showed the

least change on subsequent exposure. The brightness of exposed surfaces increased during storage at -6.6° , remained constant at -12.2° , and darkened at lower storage temperatures. Methemoglobin formation caused these changes. Storage temperature was an important factor influencing peroxide oxygen and free fatty acid increases. Spoilage of pork fat cannot be avoided in 1-yr. storage periods unless the temperature is -18° or lower.

Canadian Wiltshire bacon, XII-XIX (*Canad. Jour. Res.*, 18 (1940), *Sect. D*, No. 8, pp. 289-299, 300-304; 19 (1941), *Sect. D*, Nos. 1, pp. 22-27, figs. 2; 2, pp. 61-74, figs. 5; 3, pp. 85-95, 96-103, 104-111, figs. 2; 6, pp. 157-176).—Eight papers are presented in continuation of this series (E. S. R., 84, p. 379).

XII. Effect of heat treatment on the colour and colour stability of bacon, C. A. Winkler and J. W. Hopkins.—Interacting effects of time and temperature of heating on color of bacon were demonstrated. At 40° and 50° C., total intensity of color increased with the duration of heating, with no definite trend at 60° and 70° and a decrease in intensity at 80° . Duration of previous heating after 12 hours' exposure influenced the subsequent decrease in intensity after 96 hr. The decrease in intensity of green color was related to the duration, rather than the temperature, of heat treatment. The effects of duration of heating on red and blue stability at 12 to 20 hr. were replaced by temperature effects. Increased nitrite content of the meat after heating was negatively associated with intensity of color. It was noted that nitrite content and loss in weight on heating were correlated with increased color stability. These results were based on color determinations with the photoelectric comparator in 96 samples subjected to the different treatments.

XIII. Tenderness of bacon and effect of heat treatment on tenderness; C. A. Winkler and J. W. Hopkins.—Statistical samples from 22 packing plants indicated a significant influence of pH of both pump and cover pickle, number of "stitches," and duration of curing on tenderness. This characteristic of the bacon was not related to the salt, moisture, or nitrate content of the meat. Toughness increased with heating at from 20° to 50° C., but decreased at temperatures of from 60° to 80° . The maximum toughness was attained after heating at 50° .

XIV. Seasonal variations in colour and colour stability, C. A. Winkler, W. H. Cook, E. A. Rooke, and A. E. Chadderton.—Measurements of color and color stability of bacon cured in a factory producing a satisfactory product showed small but significant differences from time to time, but they were not attributed to seasonal effects.

XV. Quantitative bacteriological and chemical changes in tank pickle and on bacon during cure and maturation, N. E. Gibbons and W. H. White.—Settling of bacteria from the pickle was not responsible for the increased number of bacteria observed on the surfaces of sides during cure. Wiping tended to reduce the numbers of bacteria on the sides more than settling or washing. The concentration of salt, nitrate, and nitrite decreased rapidly during the first 12-24 hr. of cure in a commercial plant. Although some stratification of solutions occurred in the brine, it had little or no effect on the bacon. Bacterial and chemical changes in the pickle during cure were not related.

XVI. Colour and colour stability of pork after frozen storage and conversion to bacon, W. H. Cook.—Storing full-length rib-in pork backs at temperatures from -6.6° to -29° C. under different conditions showed the best color to be retained with storage below -17.7° , with impermeable wrappings. The lighter color of pork thawed in water or air instead of brine was markedly reduced after curing, although these colors were correlated. Color differences due to treatments were smaller at low than at high temperatures. Samples stored

under conditions that retained the original color or that produced light colors on thawing were least stable after defrosting.

XVII. *Rancidity in pork fat after frozen storage and conversion to bacon*, W. H. White.—Temperature, method of wrapping, and stage in the conversion to bacon were the most important factors governing the peroxide oxygen and free fatty acid contents of the fat of pork. The most effective conditions for retarding rancidity were storage at -18° to -23° C., with wrapping in aluminum foil followed by thawing in brine or pickle. Smoking had greater anti-oxidant effect on fat than pale-drying. Spoilage of pork or bacon fat was primarily due to oxidation.

XVIII. *Effect of temperature and bacterial growth on nitrite content*, W. H. White and N. E. Gibbons.—Samples of bacon with high and low bacterial populations by scraping and scrubbing were held at temperatures of 4° , 21° , 38° , and 55° C. for 20, 40, 80, and 160 hr. Both the total number of organisms and the number capable of reducing nitrate to nitrite were significantly correlated with the nitrite content. Furthermore, the samples adjusted to the high bacterial level usually contained more nitrite after treatment than those from the same hog but containing fewer bacteria. The increase in nitrite at temperatures below 55° was attributable primarily to bacterial growth and not to enzymes or other constituents of the bacon.

XIX. *Comparative flavour tests on Canadian and Danish bacons*, C. A. Winkler and W. H. Cook.—Tests of the comparative flavor of bacon samples by jury groups and canteens in different English areas showed Danish bacon to be superior in both pale and smoked conditions to Canadian bacon. Inferiority of the pale bacon was exaggerated by smoking. Better curing and transportation practices developed in Canada permitted delivery to the consumer in England of a generally satisfactory product. The principal complaint of Canadian bacon was excessive saltiness. Analysis of the palatability and quality reported of the representative samples were made by variance.

Studies on the energy expended by a horse at work, E. G. RITZMAN (*New Hampshire Sta. Bul. 330 (1941), pp. 26-27*).—Data on the relation of load drawn and variations in distance to energy expended by a work horse are briefly presented.

The nutritional requirements of dogs, C. M. McCAY. (Cornell Univ.). (*Cornell Vet., 31 (1941), No. 2, pp. 160-169*).—A discussion is presented of the protein and vitamin needs of dogs, with comparison of the needs of the rat and man.

Known vitamins and their functions in canine metabolism, H. E. ROBINSON and L. D. FREDERICK (*Canad. Jour. Compar. Med. and Vet. Sci., 5 (1941), No. 10, pp. 288-291*).—A discussion of the quantitative requirements of dogs for the vitamins is given.

Vitamin A deficiency in silver foxes, S. E. SMITH. (U. S. D. A. coop. Cornell Univ. et al.). (*Amer. Fur Breeder, 14 (1941), No. 3, pp. 10, 12, figs. 2*).—Six fox pups nursed by a vixen on a low-vitamin A diet developed nervous symptoms, starting with a trembling of the head, in about 4 weeks. Finally, typical xerophthalmia and histological changes in the tissues developed at 18, 25, and 27 weeks in different pups. A complete cure of the head trembling of one pup by large doses of pure vitamin A was effected. Growth rate did not suffer from the A deficiency, but one pregnant ♀ aborted at 43 days. No vitamin A was chemically detectable in the livers of the deficient foxes.

Progress report on the feeding of soybean oilmeal to foxes, C. F. BASSETT (*Amer. Fur Breeder, 14 (1941), No. 3, pp. 22-24*).—Rations containing soybean meal, beef meal, and liver meal were found satisfactory for adult foxes and

weaned pups. Foxes fed a ration with a total of 12 percent from these sources were superior in growth, fur development, sheen, and absence of tinge to pelts of other foxes fed rations containing 40 percent of raw meat. There was little difference in the soybean meals, but pelts from pups receiving hydraulic-pressure and expeller soybean meals were considered superior to pelts of pups receiving solvent-process meal. These feeding investigations were conducted with 19, 30, and 32 foxes on the soybean supplement and the meat rations each year from 1938 to 1940.

Digestibility studies with foxes, I, II (*Sci. Agr.*, 22 (1941), No. 1, pp. 18-39, fig. 1).—Two studies are reported in this series based on variance analyses with four animals in successive periods.

I. *Effect of the plane of nutrition upon the digestibility of meats*, W. R. Inman and G. E. Smith (pp. 18-32).—The digestibility of fresh and frozen beef and frozen horse meat was not affected in foxes by the plane of nutrition in which 280, 340, 400, or 460 gm. was fed per day. The data were analyzed and showed that the frozen horse meat gave the lowest values of all nutrients.

II. *Digestibility of frozen beef tripe, frozen lip meat, frozen beef hearts, and frozen cow udders*, W. R. Inman (pp. 33-39).—Lip meat and beef heart were better utilized than tripe for digestibility of dry matter, organic matter, N, and fat. Udder tissue was of low value for N utilization, but tripe was low for utilization of fat.

[Poultry studies in New Hampshire] (*New Hampshire Sta. Bul.* 330 (1941), pp. 39-40).—Studies are noted by R. C. Durgin, T. B. Charles, S. R. Shimer, and H. A. Davis on the protein requirements of chickens, and by Charles, Durgin, and W. T. Ackerman on moisture in peat litter.

A second poultry survey in Kansas, L. F. PAYNE (*Kansas Sta. Bul.* 297 (1941), pp. 56, figs. 12).—A repetition in 1940 of the 1926 survey of poultry production in Kansas (*E. S. R.*, 59, p. 165) showed that, although there have been many changes and improvements in the 14 yr., further progress may be made, particularly in more poultry enterprises and fewer poultry side lines on farms. Possibilities of a wider place for poultry are mentioned.

Intensity of fall and winter egg production of pullet progeny sired by cockerels sib-tested for intensity of production, A. E. TOMHAVE (*Delaware Sta. Bul.* 232 (1941), pp. 27, figs. 4).—Four years' trials were conducted in comparing the fall and winter production of daughters of sires selected because of the high or low production of their full sisters. In all of the four experiments, larger percentages of the pullet progeny of the sires selected for the high intensity of production of their sisters had high average intensity than the progeny of sires selected on the opposite basis. Among the daughters of sires selected because of the higher production of their sisters there were 56.9 percent producing over 70 percent and only 43.1 percent below 70 percent. In the daughters of sires selected for low intensity of production of their sisters, only 36 percent produced more than 70 percent and 64 percent were below 70 percent in production. These results are considered to indicate definitely that the hens used in the breeding pens were not responsible for the differences in intensity.

The results were accomplished by making up the breeding pens with comparable dams each year. The intensity records of production of the sire's sisters seemed a better indication of the production of his pullet progeny than similar records on the sire's and dam's ancestors or on the dam herself. These conclusions were based on production records of 232 daughters of 4 sires in the high lines and 175 daughters of an equal number of sires in the low lines.

Clutch length in relation to period of illumination in the domestic fowl, T. C. BYERLY and O. K. MOORE. (Univ. Md.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 387-390).—Data on production by pullet and laying hens show conclusively that it was possible to lengthen the clutch by synchronizing the dark and light periods to which the hen was exposed. Rate of production was increased in the 26-hr. day (14 hr. of light and 12 hr. of darkness), as contrasted with continuous lighting or shorter periods of lighting. Slightly more than 60 percent of the eggs laid by the group with 14 hr. of light and 12 hr. of darkness were laid in the dark, and this period proved somewhat more satisfactory by prolonging cycles without causing refractoriness. Ovulation and light stimulation of the pituitary usually followed soon after laying.

Factors affecting the duration of the first annual rest, I. M. LERNER and L. W. TAYLOR. (Univ. Calif.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 490-495, fig. 1).—Single, partial, and multiple correlations in 289 Single-Comb White Leghorns showed persistency, as measured by date of or age at last egg before the fall rest, to be most closely correlated (about 0.5) with the duration of rest of any of the factors studied. By association with persistency other factors, such as length of laying year and annual egg production, showed correlation with duration of rest period. Winter rate by correlation with annual egg production was correlated with the length of annual rest period. Eighty-eight percent of the birds began their rest period when the length of day was decreasing, but an association could not be established with day length. However, some seasonal effects of the rest period were indicated.

Accuracy of short-interval trap-nesting of the fowl, E. E. SCHNETZLER. (Ind. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 551-555).—Study of the annual egg production records of 380 hens and estimates of the production from trap-nesting 1, 2, 3, 4, 5, or 6 days per week or 6 consecutive days in alternate weeks showed that poultry breeders may obtain a satisfactory estimate of the annual record from either 4, 5, or 6 days per week of trap-nesting. There was only one hen in which estimates from records on 6 days per week differed by more than 10 eggs from the actual record, but the errors were greater with less frequent trapping. The accuracy of the various short-interval periods of trap-nesting as estimates of annual production was essentially the same for 83 hens in the second laying year as for the first year's production.

Relations of weights and volumes of eggs to measurements of long and short axes, W. D. BATEN and E. W. HENDERSON. (Mich. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 556-564, figs. 5).—Formulas for estimating the weights and volumes of 51 Single-Comb White Leghorn and 53 Barred Plymouth Rock eggs with the long and short axes of the egg are presented. The volume of eggs of either breed could be predicted very accurately by using both long and short axes. The density of eggs of both breeds was 1.07, and the volume could be estimated as 0.933 times the weight. The surface was computed from an ellipsoid.

Effect of colored light and colored walls on the growth and mortality of chickens, J. C. HAMMOND and H. W. TITUS. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 507-513).—Growth and development of 3,760 chicks were observed for 4 and 12 weeks in rooms in which the ceilings and walls were painted white, violet blue, black, gray, yellowish green, red, and red and dark green. From the results it became apparent that light intensity was more important than the color of the light. Chicks in a low light intensity did not learn readily to eat, and some never learned. In the black, blue, red, and red-and-green pens, relatively little light was reflected and initial mortality was high. Colors of high reflectivity were favorable to growth, but after chicks

were taught to eat they also grew well in low light intensity. Neither the color nor the intensity of light to which the pullets were exposed during the first 16 weeks of their life affected live weight, egg production, or fertility or hatchability of the eggs.

Protein requirements of chickens at various stages of growth and development, II, A. E. TEPPER, R. C. DURGIN, T. B. CHARLES, S. R. SHIMER, and H. A. DAVIS (*New Hampshire Sta. Bul.* 335 (1941), pp. 15).—The protein requirements of floor-managed New Hampshires fed rations containing 15, 17, and 19 percent of protein from meat scrap, fish meal, dried skim milk, and mixtures of all three were somewhat different from those for cage-managed birds, as reported in a previous bulletin (E. S. R., 81, p. 694). The most rapid gains were made on the higher protein levels. The mixture of three animal protein sources was more desirable from the standpoint of growth, efficiency of feed utilization, production, laying-house mortality, hatchability of eggs, and control of gizzard lesions in the chicks than any one animal protein concentrate.

The effect of increased pantothenic acid in the egg on the development of the chick embryo, A. TAYLOR, J. THACKER, and D. PENNINGTON (*Science*, 94 (1941), No. 2449, pp. 542-543).—A relatively high level of pantothenic acid in the egg was associated with improved hatchability and increased hemoglobin concentration in the blood during incubation of the developing embryos. A low concentration of pantothenic acid was associated with a larger than normal brain, while both heart and brain were depressed in relative size in embryos from the eggs with higher levels of pantothenic acid. The study was conducted on incubating eggs injected with pantothenic acid and on eggs from hens on high pantothenic acid rations.

The vitamin A reserve of diseased fowls, V. B. HOLLAND, G. H. SATTERFIELD, H. C. GAUGER, A. D. HOLMES, and F. TRIPP. (Univ. N. C. et al.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 543-550).—Quantitative determinations of Lovibond blue and yellow units of the vitamin A and carotene in the livers of 85 birds with various diseases submitted from different places for autopsy show wide ranges. Therefore it was not possible to correlate a specific avian disease or parasitic infestation with the vitamin A or carotene stores in the liver.

Feeding values of low- and high-test weight grains for chickens, W. E. POLEY and W. O. WILSON (*South Dakota Sta. Bul.* 353 (1941), pp. 32, figs. 2).—These studies were conducted from 1937 to 1940 with corn, wheat, and barley ranging in weight per bushel from 49.5 to 56, 42 to 58.5, and 31 to 50 lb., respectively. In each case the light or heavy grade of the cereal grain, ground or whole, was added to both the mash and scratch. Similar amounts of heavy, medium, and light grades of corn, wheat, and barley were required for starting, growth, and egg production. Small variations in the rapidity of growth, production, and hatchability were noted.

Corn distillers' dried grains with solubles in poultry rations, I, II. (Mass. Expt. Sta. et al.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 527-535, figs. 5; pp. 536-542, figs. 4).—Two papers in this series on corn distillers' grains for chicks and laying hens are presented.

I. Chick rations, K. G. Shea, C. R. Fellers, and R. T. Parkhurst.—When corn distillers' dried grains were fed to rats as the sole source of protein the growth rate was much retarded, but normal growth resulted when 25 percent of the protein was derived from the corn distillers' grains. Satisfactory growth up to 8 or 10 weeks was obtained in White Leghorn and crossbred chicks when dried grains replaced all of the dried skim milk and 50 percent of the soybean meal in the New England Conference chick ration if the protein content remained the same, but it was not possible to substitute successfully grains for 50 percent

of the meat scrap and fish meal. Substitution for a large portion of the alfalfa meal was less satisfactory. The substitutions for the fish meal or dried skim milk resulted in slightly better feather development and fleshing. The dried corn distillers' grain slightly improved the leg coloring produced with dried skim milk. The corn distillers' dried grains with solubles constituted an excellent source of riboflavin and thiamin, and the protein was of good supplementary quality. There were also present in the corn distillers' dried grains small amounts of vitamins A, D, and E and pantothenic acid. In this study, pens of 50 chicks were used in tests of each ration.

II. *Laying rations*, F. L. DICKENS, R. T. PARKHURST, and C. R. FELLERS.—Corn distillers' dried grains with solubles satisfactorily replaced dried skim milk and fish meal and part of the meat scraps in the New England Conference laying ration, provided the protein content was not altered. The corn distillers' dried grains with solubles used were the residue that remained after extraction of alcohol and distilled liquors from corn or a mixture of grains. The thin slop containing yeasts, lactic acid, and soluble solids was included. Egg production, egg weight, body weight, egg quality, and feed efficiency were comparable in all of the 8 lots of 22 Single-Comb Rhode Island Reds fed in the study over a period of 1 yr. Fertility and hatchability of the eggs, however, were reduced somewhat with the substitution of the distillers' grains for the animal proteins.

Weight and quality of the yolks of eggs of chickens fed diets containing vegetable oils, B. W. HEYWANG and H. W. TITUS. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 483-489).—Eggs of eight groups of pullets fed for 98 days on a low-fat ration to which 4 percent of coconut oil, palm oil, peanut oil, cottonseed oil, soybean oil, or hempseed oil was added or on a normal or low-fat basal mash showed no significant differences in yolk weight, ratio of egg weight to yolk weight, or yolk index when fresh or after 6 mo. of storage. However, the yolks from the group on cottonseed oil deteriorated in storage, and it was possible to obtain height and diameter measurements on only a few of them. Except for the eggs from the cottonseed oil group, there was no difference in mottling of yolks after storage. Egg production and gains in live weight in the different groups were similar. Evidently laying hens on low-fat rations can produce yolks of average size or quality. No significant differences were found between the group that received the low-fat rations and those with oil supplements.

Japanese tendergreen mustard, Italian rye grass, and oats as a source of green feed for laying hens, G. R. SIPE and H. D. POLK. (Miss. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 406-412).—Grazing crops reduced the feed requirement for egg production from approximately 6 to 10 percent and lowered mortality, but there was no influence on hatchability. The yolks of eggs produced by hens on pasture crops were darker than yolks of eggs laid by birds on dry rations. In each of 4 yr., groups of 25 hens or pullets on a cereal ration with fish meal were given access in different lots to mustard, oats, and ryegrass pasture. The number of days of grazing on ryegrass were greater in the winter and spring months and throughout the year, with oats second and mustard last, but for summer grazing mustard was best. The amounts of feed per dozen eggs with the different grazing crops were oats 6.27 lb., mustard 6.41, and ryegrass 6.58 lb. In dry-lot feeding 6.98 lb. of feed were required per dozen of eggs.

Effects of sulphur on growing chickens, D. J. CABRERA (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 2, pp. 89-97).—Four experiments demonstrated that continuous feeding of flowers of sulfur added at the rate of 2.64 percent to the mash of chicks exerted a deleterious effect on growth. The sulfur was better tolerated by 8-week-old than by 3-week-old chicks.

The effect of the level of vitamin D on egg production and hatchability of Bronze turkey hens, L. A. WILHELM, E. I. ROBERTSON, and M. RHIAN.

(Wash. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 565-569, figs. 2).—When no vitamin D was added to the rations of turkey hens confined without access to sunlight, egg production and hatchability were very low and egg production ceased after 48 days. There was no benefit in egg production or hatchability from additions of more than 100 A. O. A. C. chick units of vitamin D in cod-liver oil per 100 gm. of a ration including a variety of feeds. The largest eggs were produced by hens receiving 400 units of vitamin D. Soft-shelled eggs were less frequent with more than 200 units of vitamin D, but shell spotting was not so prevalent with rations containing less than 200 units.

These results were obtained with four groups of Bronze turkeys deprived of vitamin D. The experiment started on December 20 by the addition of 0, 100, 200, and 400 A. O. A. C. chick units of vitamin D in cod-liver oil per 100 gm. of feed. In a second part of the experiment, when the ration of the group receiving no cod-liver oil was supplemented with 200 units of vitamin D and given access to sunlight, egg production and hatchability were rapidly restored. There was no deleterious effect or shell spotting from excessive amounts of vitamin D.

Salt tolerance of turkey poults, J. O. FOSS (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, p. 7).—Turkeys were found susceptible to over 4 percent of salt in the ration.

A study of turkey curing and smoking, A. K. BESLEY and S. J. MARSDEN. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 496-506, figs. 2).—Turkeys were covered with brine and cured for from 1 to 4 weeks, followed by smoking. A satisfactorily cured turkey was produced in a curing period of from 2 to 3 weeks. Removal of the leg tendons aided penetration of the curing medium. Smoking for 16 hr. at 140° F. gave a more attractive color than 20 hr. at 110°. Analyses of the meat led to the conclusion that salt entered the breast and thigh muscles through channels other than the skin, probably from the body cavity.

DAIRY FARMING—DAIRYING

[Investigations in dairying in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 87-88, 89-90, 121-126, 133-134, 134-135, 136-137, 138-139, 139-141).—Abstracts of the following papers are listed in these proceedings: Summary of Barn Hay-Curing Activities, by J. A. Schaller (pp. 87-88); The Georgia Studies of Barn-Dried Hay, by W. E. Hudson (p. 89) (Univ. Ga.); Feeding Studies of Barn-Dried Hay Versus Field-Dried Hay, by C. E. Wylie and S. A. Hinton (p. 90) (Tenn. Expt. Sta.); Virginia Studies of Barn Hay-Drying, by J. W. Sjogren and P. D. Rodgers (p. 90) (Va. A. and M. Col.); The Place of Dairying in the Southern Farm Program, by C. N. Shepardson (pp. 121-123) (Tex. A and M. Col.); Development of Outlets for Southern Milk Products, by C. W. Holdaway (p. 123) (Va. A. and M. Col.); Correlating the Dairy Program With the Programs of Other Educational and Regulatory Agencies in Southern Agriculture, by C. G. Cushman (pp. 123-126) (Clemson Agr. Col.); Organizing Artificial Insemination Associations, by C. A. Hutton (pp. 133-134) (Univ. Tenn.); Age of Bulls for Artificial Insemination Associations, by R. G. Connelly (pp. 134-135) (Va. A. and M. Col.); Recent Observations on Cream Used for Making Butter in the South, by E. L. Fouts (pp. 136-137) (Univ. Fla.); Relative Fertility of Dairy Animals, by L. P. La-Master (p. 138) (Clemson Agr. Col.); Feeding Clover-Molasses Silage, by A. D. Pratt (pp. 138-139) (Va. Expt. Sta.); Legume Silage for Dairy Cows, by C. E. Wylie and S. A. Hinton (pp. 139-140) (Univ. Tenn.); Feeding Hay With Pasture, by C. H. Staples (p. 140) (La. State Univ.); The Ascorbic Acid Content of

Milk as Affected by Varying Amounts of Shark Liver Oil in the Ration, by H. E. Skipper, I. I. Rusoff, and L. M. Thurston (p. 140) (Fla. Expt. Sta.); and Persistency of Lactation in Relation to Milk Production, by D. W. Colvard (pp. 140-141) (N. C. Expt. Sta.).

[**Dairying investigations at the New Hampshire Station**] (*New Hampshire Sta. Bul. 330 (1941), pp. 26, 33-35*).—Brief progress reports (E. S. R., 83, p. 814) are presented for studies on the protein requirements for growth of dairy heifers and their rate of metabolism at various ages, by E. G. Ritzman and N. F. Colovos; a comparison of dry-feed systems for raising dairy calves and the economy of raising dairy replacements under New Hampshire conditions, both by K. S. Morrow; and variability in the solids-not-fat content of milk as influenced by heredity, by H. C. Moore and Morrow.

[**Investigations with dairy cattle and dairy products in Vermont**] (*Vermont Sta. Bul. 475 (1941), pp. 22-28*).—Progress results (E. S. R., 84, p. 235) are presented for the following lines of investigation by H. B. Ellenberger: The effect of feeding vitamins A and D in concentrated cod-liver oil with different grades of hay to dairy calves, the conservation of nutrients in grasses and legumes as hay and as silage, the artificial insemination of dairy cows, the relation of ascorbic acid and oxygen to the oxidized flavor of milk, temperature changes occurring in cans of milk while awaiting and during transportation, accounting for milk fat in dairy plants, factors other than bacterial metabolic activity affecting the rate of dye reduction in milk, factors to be considered in the laboratory pasteurization of milk, and pH changes in stored media.

The improvement of a Holstein-Friesian herd through the use of sires with superior pedigrees: The first twenty years, 1920-1940, T. A. BAKER and A. E. TOMHAVE (*Delaware Sta. Bul. 231 (1941), pp. 23, figs. 8*).—This bulletin presents a summary of the production records of the group of cows assembled as a foundation herd in 1919 and the dam-daughter comparisons for the six herd sires, all selected as young unproved bulls, used in this herd during the ensuing 20-yr. period. With one exception, the daughters of these sires excelled their dams in average butterfat production, which has resulted in a rather steady increase in the average production level of the herd. Daughters of the last two bulls used produced on the average 35 percent more butterfat per year than the foundation cows, and it appeared that hereditary factors tending toward very low production had been eliminated from the germ plasm of the herd.

Grasses [and] legumes join corn [and] sorghum as silage material: Silage urged for dairy cows, W. C. COWSERT (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 9, pp. 1, 2*).—Practical suggestions are offered on the ensiling of grasses and legumes and the inclusion of various types of silage in the dairy ration. Records on the hay and silage consumption when 8 lb. of Johnson grass hay and 30 lb. of sorghum silage per cow daily were fed showed a refusal of 25.86 and 0.32 percent of the hay and silage, respectively. When 8 lb. of lespe-deza hay and 30 lb. of sorghum silage were fed, 11.41 and 1.87 percent of hay and silage, respectively, were refused.

The physiological effect of molasses- and phosphoric acid-alfalfa silages on the dairy cow, W. A. KING and W. C. RUSSELL (N. J. Expt. Stas. and Rutgers Univ.). (*Amer. Chem. Soc. Mtg., 102 (1941), Abs. Papers, p. A21*).—In a continuous feeding trial of 20 weeks' duration, four comparable groups of three cows each received (1) molasses-alfalfa silage only, (2) molasses-alfalfa silage, grain, and hay, (3) phosphoric acid-alfalfa silage only, and (4) phosphoric acid-alfalfa silage, grain, and hay. The serum calcium levels of all cows remained quite constant throughout the experiment. The cows receiving

the phosphoric acid silage showed increased levels of inorganic phosphorus of the plasma, a decrease in CO₂-combining power of the plasma, and sharp variations in the pH and ammonia content of the urine. In several periods urine pH was as low as 5.45, and the urinary ammonia as high as 1,300 mg. per 24 hr. Cows receiving hay and grain with the phosphoric acid silage showed less marked variations in these characters than those receiving the silage alone. Cows receiving the molasses-alfalfa silage remained normal throughout.

The content of grass-juice factor in legume silages and in milk produced therefrom, B. C. JOHNSON, C. A. ELVEHJEM, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 861-864, fig. 1).—Extending this line of investigation (E. S. R., 82, p. 662), additional evidence was secured to indicate that the grass-juice factor of forages is well preserved in silage, although the extent of preservation varied with different methods of ensiling. Silages prepared with phosphoric acid were richer in this factor than those from comparable materials treated with molasses or untreated. Alfalfa silage preserved with soured whey concentrate showed excellent preservation of this factor. The concentration of the grass-juice factor in various silages was directly reflected in the potency of this factor in winter milk when the various silages were fed to cows.

Rumen synthesis of the vitamin B complex on natural rations, M. I. WEGNER, A. N. BOOTH, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 90-94).—Experiments were conducted similarly to those previously reported (E. S. R., 84, p. 807), except that rations composed of natural feeds were used instead of a synthetic diet. The experimental subject was a Holstein heifer weighing about 1,000 lb., with a rumen fistula. In each of six experiments comparative values were obtained for the amounts of thiamin, riboflavin, pyridoxin, pantothenic acid, nicotinic acid, and biotin in the feed and in the rumen content. In practically all cases higher values were found in the rumen ingesta, indicating that synthesis of these factors had occurred. With the exception of flavin, variations in the amount of protein or urea in the ration exerted little, if any, effect on the vitamin content of the ingesta.

The utilization of urea by ruminants as influenced by the level of protein in the ration, M. I. WEGNER, A. N. BOOTH, G. BOHSTEDT, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 835-844, figs. 9).—Continuing this line of investigation (E. S. R., 85, p. 100), the ammonia, nonprotein nitrogen, total nitrogen, and dry matter in the rumen content of a Holstein heifer were determined at frequent intervals after the feeding of experimental rations which were constant except for the levels of linseed meal and urea contained in the concentrate mixture. In three series of experiments, in which (1) rates of linseed meal and of urea were simultaneously increased, (2) rates of linseed meal were successively increased with urea content held constant, and (3) urea levels were successively increased without the addition of linseed meal, as the level of protein in the concentrate mixture increased from the basic level of 11.3 to 24 percent the protein content of the rumen ingesta showed a marked increase. The rate of conversion of urea nitrogen to protein in the rumen, however, decreased as the protein level of the rumen ingesta became greater than 12 percent. When the level of protein in the concentrate fed was increased to more than 18 percent, not only the rate, but also the extent, of conversion of urea nitrogen to protein began to decrease. When no linseed meal was added to the basal mixture, the added urea was completely utilized up to a level of 4.5 percent (protein equivalent of 12 percent) of the grain mixture.

Studies on pituitary lactogenic hormone, V, VI, C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 43-55, figs. 2; 140 (1941), No. 1, pp. 43-53, figs. 2).—Two papers are presented in continuation of this series (E. S. R., 85, p. 607).

V. Reactions with iodine.—In an effort to detect "functional" molecular groupings, this study was directed toward determining the effect on biological activity of specific modifications of the molecule. The hormone was iodinated by reaction with iodine for 1 hr. at room temperature in weakly alkaline, buffered solution. The resulting product, separated and purified by dialysis, was almost completely inactive. Analytical values for the nitrogen, iodine, and tyrosine content suggested that the iodine had reacted only with the tyrosine portion of the molecule. This was further borne out by a comparative study of the reactions of iodine with the hormone and with pure tyrosine in different solvents and at varied pH. Data on the rate of reaction suggested that some tyrosine groups of the hormone had reacted with iodine at the same rate as pure tyrosine, whereas other tyrosine groups had reacted more slowly. At pH 3.8 or lower there was no reaction between iodine and the hormone, indicating, thus, the absence of cysteine or —SH groups, which characteristically react with iodine in acid solution. The isoelectric point of the iodinated hormone shifted from pH 5.8 to about pH 4.7.

VI. Molecular weight of the pure hormone.—The molecular weight of the lactogenic hormone was estimated by osmotic pressure measurement to be approximately 26,500. When the minimum in molecular weight of the lactogenic hormone was ascertained, estimations based on the tryptophan, tyrosine, cystine, arginine, and sulfur contents of the pure hormone indicated a molecular weight of approximately 25,000.

Influence of lactogenic preparations on production of traumatic placentoma in the rat, H. M. EVANS, M. E. SIMPSON, and W. R. LYONS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 586-590).—The purified lactogenic hormone, noted above, induced luteinization of hypophysectomized or immature ♀s to stimulate the production of traumatic placentomata. In mature ♀s, 1 mg. or more of the lactogenic hormone administered daily for 10 days produced placentomata in all of 8 animals tested, whereas 0.5-mg. doses were positive in 2 of 4 animals, and all of 13 were negative without any lactogen. Immature ♀s in which ovulation was induced by gonadotropin gave positive results with 0.1 mg. in all cases.

Effect of desoxycorticosterone on pituitary and lactogen content, C. W. TURNER and J. MEITES. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 232-234).—Injections of ♂ and ♀ guinea pigs for from 10 to 20 days with 7 to 20 mg. of desoxycorticosterone acetate daily stimulated growth of the mammary gland and increased pituitary weight, but there was no increase in the lactogen content of the pituitaries as determined in pigeon crop-gland tests. With oestrogen treatment for comparison there was at least a threefold increase in the lactogen content of the pituitary.

Growth of the lobule-alveolar system of the mammary gland with pregnenolone, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 453-456).—Continuing these studies (E. S. R., 84, p. 611), the authors found that the lobule-alveolar system of the mammary glands of castrate ♀ mice was stimulated by pregnenolone, alone and in combination with oestrone. This product was found to have a property similar to progesterone. In a comparison with progesterone it was found that the hyperemia of the genital tract caused by oestrogens probably stimulated the development of the lobule-alveolar tissue in the mouse. Preg

neninolone was estimated to have one-half the activity of progesterone in this respect.

Effect of stilboestrol on the mammary gland of the mouse, rat, rabbit, and goat, A. A. LEWIS and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 845-860, figs. 4).—Stilboestrol suspended in oil when injected into male mice for from 2 to 4 weeks at rates ranging from $\frac{1}{6}\gamma$ to $\frac{1}{2}\gamma$ per day, caused extensive mammary duct proliferation. Such treatments produced similar results in spayed virgin females, but approximately six times as great a dosage administered orally was required to produce comparable results. Mammary duct growth was also stimulated in castrated male rats by the subcutaneous injection of $\frac{1}{4}\gamma$ to 1γ of stilboestrol daily. Rats apparently required a higher dosage than did mice to stimulate duct growth. Both male and female rabbits responded readily to stilboestrol administered subcutaneously as pellet implantations, or by percutaneous application. The injection of 0.4γ per day produced extensive duct development in male rabbits, with evidence of early lobular development after 40 to 60 days' treatment. Well-developed duct systems grown with stilboestrol in male rabbits came into lactation upon the administration of lactogen. Copious milk secretion resulted from the injection of stilboestrol alone in a normal adult female rabbit. The subcutaneous injection of stilboestrol into virgin goats resulted in abundant and prolonged lactation, but little increase in the extent of the glands was apparent. Subcutaneous injection followed by pellet implantation in a castrated male goat failed to stimulate mammary gland development, although teat development was stimulated. It is suggested that failure may have been due to inadequate dosage.

[Abstracts of dissertations on dairy problems] (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 75-79, 148-154).—Abstracts of the following doctoral theses pertaining to dairy problems are given: Distribution of Salt in Butter and Its Effect on Bacterial Action, by W. H. Hoecker (pp. 75-76); Relationship of the Lipolytic and Proteolytic Activities of Various Penicillia to the Ripening of Blue Cheese, by C. Jensen (pp. 77-79); The Effect of Soybeans and Soybean Oil on Milk and Butterfat Production and on the Quality of the Butterfat, by N. K. Williams (pp. 148-151); and Action of Mold Inhibitors on Dairy Products, by J. J. Willingham (pp. 152-154).

A new microscopic procedure for the detecting and locating of the source of thermoduric organisms in milk, W. L. MALLMANN, C. S. BRYAN, and W. K. Fox. (Mich. Expt. Sta. et al.). (*Jour. Milk Technol.*, 4 (1941), No. 4, pp. 195-199).—The proposed test consists in incubating from 5- to 10-cc. samples of suspected milk at from 58° to 60° C. for 2 hr., after which a microscopic count is made by the standard procedure. Samples showing bacterial counts of 40,000 or more per cubic centimeter are considered to contain thermoduric bacteria in excessive numbers. By applying this test to milk samples obtained from producers' supplies and at successive steps in the processing of milk or its products, the source of contamination may be located.

A new group of sterilizing agents for the food industries and a treatment for chronic mastitis, F. M. SCALES and M. KEMP (*Internatl. Assoc. Milk Dealers, Assoc. Bul.* 19 (1941), pp. 491-520).—Extensive studies by the authors on various organic detergents or wetting agents have definitely confirmed their earlier findings that these compounds may possess strong germicidal qualities. These properties were most pronounced when the solutions were adjusted to a relatively low pH. Many of these wetting agents when adjusted to a pH of 4.0 were more strongly germicidal than the alkaline sodium hypochlorite solutions commonly used for sterilizing agents. Gluconic or phosphoric acids are recommended as acidifying agents because of their low corrosion properties. A con-

centration of 0.03 to 0.05 percent of the wetting agent when this is adjusted to pH 4 is recommended for general industrial use, although solutions of only 0.01 percent concentration gave good sterilization under carefully controlled conditions. Practical procedures are suggested for the sterilization of dairy farm utensils, the hot or cold sterilization of 10-gal. milk cans with nonporous surfaces, and for drinking glasses and utensils in public eating places. A treatment for chronic mastitis, using Zephiran as a germicide and Triton No. 720 as a dispersing agent, is proposed. This material, even when diluted with milk, completely destroyed a heavy inoculum of *Streptococcus agalactiae* within 3 min.

The relationship of pH to some curd characteristics of modified milks, A. B. STORRS (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 865-871, figs. 2).—Lots of commercially prepared milks, including (1) both raw and pasteurized normal milk, (2) homogenized milk, (3) enzyme-treated milk, (4) base-exchange milk, and (5) evaporated milk diluted 1:1 with water, were each divided into subsamples which were adjusted to pH levels of 6.0, 5.5, 5.0, 4.5, and 4.0. Each sample was then subjected to the Chambers-Wolman curd test. The curd surface area of any of the milks appeared to be lowest at the highest pH at which complete coagulation would occur. At any pH below that required for complete coagulation, the curd surface area increased as the pH was lowered. The effect of pH upon the completeness of curd formation varied considerably with the different processes involved, leading to the conclusion that there does not seem to be any single pH level suitable for comparative in vitro tests on all milks.

Rancidity studies on mixtures of raw and pasteurized homogenized milk, P. B. LARSEN, G. M. TROUT, and I. A. GOULD. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 771-778, figs. 3).—Continuing this line of investigation (E. S. R., 82, p. 529), experiments were conducted on mixtures composed of (1) unhomogenized raw and homogenized pasteurized milk, (2) homogenized raw and homogenized pasteurized milk, and (3) unhomogenized raw and homogenized raw milk. Rancidity and an increase in acidity invariably developed on storage when either homogenized or unhomogenized raw milk was mixed with homogenized pasteurized milk. The maximum increase in acidity occurred when the ratio of raw to homogenized pasteurized milk was approximately 1:1, regardless of whether the raw milk was homogenized or not, indicating that the amount of increased surface or increased surface activity caused by homogenization and the amount of lipase added by the raw milk are of about equal importance in the development of rancidity in homogenized milk.

Effect of certain factors upon lipolysis in homogenized raw milk and cream, I. A. GOULD. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 779-788, figs 4).—Milk and cream separated and/or homogenized at 100° F., using homogenization pressures of 500 to 1,000 lb., were employed in these experiments. When copper was added to milk in concentrations up to 10 p. p. m., either prior to or subsequent to homogenization, it had no significant influence on the extent of lipolysis. The addition of sodium chloride to cream obtained from homogenized milk markedly retarded the rate of lipolysis, a concentration of 8 percent practically inhibiting this reaction. The addition of formalin to cream from homogenized milk had little or no influence on the rate of fat splitting in the cream. Lipase activity in the homogenized cream was found to vary directly with storage temperature, the amount of free fatty acids practically doubling as temperature increased of 0° to 35° and increasing twelvefold from 0° to 70°. Studies with homogenized remade milk from cream and skim milk gave evidence that the active lipase is contained in the plasma fraction of the milk. Frac-

tionation of the plasma indicated that a considerable portion of the lipolytic activity of the milk is removed with the casein, although some occurred in the whey fraction. Evidence was secured also to indicate that lipolysis in homogenized raw milk proceeds independently of oxidative changes in the fat. It is concluded that lipolysis in homogenized raw milk is not affected, in all cases, by the same factors which have been found to influence the rate of fat splitting in normal milk. Whether these variations are due to different lipases or whether merely due to physical or physicochemical changes involving the fat globules has yet to be definitely determined.

Oxidation-reduction potentials and the oxidized flavor in homogenized milk, P. B. LARSEN, I. A. GOULD, and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 789-793, figs. 2).—Milks normally susceptible to oxidized flavor development and nonsusceptible milks contaminated with 1 or 3 p. p. m. of copper were included in these studies. In all cases the oxidation-reduction potential was similar in homogenized and unhomogenized milks. Homogenization at 2,500 lb. stabilized the susceptible milk and also the nonsusceptible milk containing 1 p. p. m. of copper against oxidized flavor development during a 10-day holding period, but failed to protect entirely the milk to which 3 p. p. m. of copper was added. Thus it appeared that the mechanism by which homogenization protects or retards oxidized flavor development is independent of oxidation-reduction potentials.

The production and use of concentrated skim milk foam, B. H. WEBB. (U. S. D. A.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 829-834, fig. 1).—Whipping tests with a number of reconstituted dried skim milks and condensed skim milks revealed that when the total solids content was adjusted to from 25 to 30 percent a stiff white foam of reasonable stability was produced. However, wide variations were encountered in the whipping properties of the different milks, overrun ranging from 150 to 450 percent and foam stability varying from 10 to 90 min. Heat treatment usually improved the whipping quality, but the drastic heat treatment used in atmospheric drum drying resulted in a product of relatively poor whipping quality and low foam stability. Commercial milk powders prepared for baking purposes generally possessed good whipping ability. The use of rennet or acid as stabilizing agents improved the set of the whip, but subsequent disturbance caused excessive wheying off. Fruit whips similar to an egg white product could be prepared by adding sugar to the skim milk foam and stabilizing the whip by stirring fruit pulp into it.

Flavor development in salted butter by pure culture of bacteria.—Preliminary results, W. H. HOECKER and B. W. HAMMER (*Iowa Sta. Res. Bul.* 290 (1941), pp. 317-345, figs. 2).—Six series of experimental churnings were made in which the diacetyl and acetylmethylcarbinol contents of the cream, buttermilk, and butter (fresh and after storage) and the flavor score of the butter from cream with no culture added were compared with those in which butter culture or pure cultures of *Streptococcus citrovorus*, *S. paracitrovorus*, *S. diacetilactis*, *S. citrophilus*, *S. aromaticus*, or an unidentified organism were added to the cream. Citric acid was added to all cultures, except *S. aromaticus*, before or during the incubation period.

All pure cultures in milk containing citric acid produced relatively large amounts of diacetyl and acetylmethylcarbinol, while *S. aromaticus* (which does not ferment citric acid) produced considerable diacetyl but only small amounts of the carbinol. The diacetyl contents of creams plus culture immediately after mixing were both higher and lower than the calculated theoretical amounts, while the carbinol contents were about the same as the theoretical values in most cases. Significant changes in these values occurred after hold-

ing the cream plus culture for 16 hr. at 40° F. Only small percentages of the diacetyl and acetylmethylcarbinol present in the cream plus culture were retained in the butter, the remainder occurring in the buttermilk. The percentage retention in butter was essentially the same in all cases. Butter made without the use of culture or with *S. aromaticus* contained only small amounts of diacetyl and acetylmethylcarbinol, whereas butter made with the other cultures usually contained appreciable amounts of these compounds. Both increases and decreases in diacetyl occurred during storage of butter either at 0° or 35°, larger changes usually occurring at the latter temperature. In some instances diacetyl content increased after 2 weeks' storage, followed by decreases after 4 weeks. The acetylmethylcarbinol content of the butter generally showed little change during storage. Butter made with citric acid-fermenting cultures usually contained relatively large amounts of diacetyl and acetylmethylcarbinol and such butters commonly placed high in a series of churnings, although butters containing exceptionally large amounts of these compounds sometimes placed low. Butter made without culture or with *S. aromaticus* usually placed low in the series.

The reliability of the room temperature holding test as an index to the keeping quality of butter. D. H. JACOBSEN, C. C. TOTMAN, and T. A. EVANS. (S. Dak. State Col.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 883-890, fig. 1).—In further studies (E. S. R., 77, p. 844), 78 lots of butter representing 25 different South Dakota creameries were included. Duplicate 5-oz. samples of each were held at 70° F. for 7 days and at 40° for 28 days, respectively, after which all were subjected to scoring and microbiological analysis. When divided into groups showing loss in score of less than 1 point and 1 point or more on the basis of the 7-day holding test, there was a close agreement between the loss in score under the holding test and that at 40° for 1 mo., although the lower quality butters showed somewhat greater loss at the higher temperature. The room-temperature holding resulted in more bacterial deterioration than the low-temperature holding as reflected in the flavor produced and verified by the numbers of lipolytic and proteolytic bacteria present. It is concluded that the holding test is useful and fairly accurate as a means of detecting butter of unstable handling quality. The chief factor influencing the reliability of the test appears to be the difference in activity of certain types of bacteria at the incubation temperatures and at lower temperatures.

The bacteriological analysis of creamery waters. H. WOLOCHOW, H. R. THORNTON, and E. G. HOOD (*Canad. Dairy and Ice Cream Jour.*, 20 (1941), No. 2, pp. 23-25).—Eighty-five samples of water from 37 Alberta creamery water supplies were analyzed in this study. Data are presented on the total bacterial count and proteolytic counts obtained by plating on nutrient gelatin and on tryptone-glucose-beef extract-skim milk agar, each incubated at from 10° to 15° C. for 4 days. A large proportion of the waters examined were seriously contaminated with undesirable bacteria, capable of producing flavor defects in cream and butter. The practical aspects of these findings and also the shortcomings of methods commonly employed in water analysis are discussed.

Bacteriology of cheese.—VI, Relationship of fat hydrolysis to the ripening of Cheddar cheese. C. B. LANE and B. W. HAMMER (*Iowa Sta. Res. Bul.* 291 (1941), pp. 349-384).—Continuing this series of investigations (E. S. R., 84, p. 522), four types of milk were used in the various trials as follows: (1) Raw milk, (2) pasteurized milk, (3) skim milk (raw or pasteurized) plus homogenized cream (raw or pasteurized), and (4) pasteurized milk (or raw milk in a few trials) plus material containing lipolytic enzyme. The various sources of lipolytic enzyme included pancreatin; desiccated mammary tissues of cows,

ewes, and sows, and aqueous sodium chloride extracts of them; and desiccated liver and spleen tissues. A standardized manufacturing procedure was used throughout, and cheeses were scored for flavor, body, and texture at intervals during ripening.

Cheese made from raw homogenized cream mixed with skim milk (raw or pasteurized) commonly developed a rancid flavor early in ripening, but eventually the cheese was not rancid and was more satisfactory in flavor than cheese from pasteurized milk or from pasteurized homogenized cream mixed with pasteurized skim milk. In some cases it was even more satisfactory in flavor than cheese made from raw milk. Cheeses having relatively high fat acidities commonly ranked high in flavor. Cheese made from pasteurized milk had very low fat acidities and lacked flavor, while raw milk cheese had somewhat lower fat acidities than that made from raw homogenized cream plus skim milk but higher acidities than that made from pasturized homogenized cream plus pasteurized skim milk. Cheese produced from pasteurized milk containing pancreatin developed a disagreeable rancid flavor immediately after manufacturing, and the condition did not disappear during ripening. The addition of desiccated mammary tissues or extracts of them to pasteurized milk induced rather marked lipolysis in the cheese and commonly had a desirable effect on the ripened cheese, although rancidity commonly occurred during the early stages of ripening. Such cheese generally contained slightly more soluble nitrogen than cheese made without such materials. Both desiccated liver and spleen tissues or extracts of them showed some lipolytic activity in cream-sugar mixtures. However, an extract of liver had little effect when added to pasteurized milk for cheese, while spleen tissue or extract sometimes showed a beneficial effect.

The control of acid development in Cheddar cheesemaking, R. M. DOLBY (*New Zeal. Jour. Sci. and Technol.*, 22 (1941), No. 5A, pp. 289A-302A, figs. 4).—Using pH of the curd as an index of acidity, the New Zealand Dairy Research Institute investigated the effects of certain modifications in the cheese-making process on the rate of acid production (*E. S. R.*, 84, p. 811). Comparison of a number of starters differing considerably in activity, ability to withstand cooking temperatures, etc., indicated that when the percentage of starter and the acidity at running were adjusted to give the same rate of acid development in the later stages of the process, cheeses of the same pH were produced. Variations in the percentage of starter used markedly influenced the rate of acidity increase in the early stages but had a much less effect in the later stages. Acidity at the time of draining the whey definitely influenced the rate of acid production in the later stages and the acidity of the cheese, low acidity at the time of running tending to give a low acid cheese. The extent of stirring of the dry curd had no significant effect on the rate of acid development during drying and salting. Variations in the pH at the time of salting the curd had no appreciable effect on the acidity of the cheese. It did affect salt concentration, however, low acidity favoring a relatively high degree of salt retention. Cheese was found to be most highly buffered between pH 4 and pH 5. The use of pH measurements on the curd is recommended as a valuable step in controlling acid production during cheese making.

Observations on delayed salting of brick cheese, W. L. LANGHUS and W. V. PRICE. (*Univ. Wis.*). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 873-881).—Employing a standardized manufacturing process, experimental lots of brick cheese were made from both raw and pasteurized milks. Loaves of cheese from each lot were divided into groups before salting. Lots of the raw milk cheese were salted on the first or the fifth day after manufacture and the pasteurized cheeses on the first, fifth, or ninth day. All lots were salted by

holding in a 23-percent sodium chloride solution for 48 hr. When judged at 14 days of age, during which period the cheese was held in the factory, there was an apparent improvement in the body of the cheese as a result of delayed salting. After curing for 10 weeks, however, this benefit had disappeared, and the general quality of the cheese was not as good as that of cheese salted on the first day. It appeared that the addition of salt soon after making established a desirable trend in flavor production and body changes in brick cheese curd which did not occur when salting was delayed.

[Abstracts of papers on ice cream manufacturing] (*Internatl. Assoc. Ice Cream Mfrs. Ann. Conv., Atlantic City, Rpt. Proc., 40 (1940), vol. 2, pp. 7-49, 52-63, 74-85, 90-101, figs. 13*).—The following papers were presented before the Production and Laboratory Council: The Effect of Certain Factors on the Keeping Quality of Frozen Cream, by C. D. Dahle, R. K. Lawhorn, and J. L. Barnhart (pp. 7-23) (Pa. State Col.); Vaccination of Ice Cream Mix, by N. E. Fabricius (pp. 23-31) (Iowa State Col.); Dextrose and Corn Syrup for Frozen Desserts, by A. C. Dahlberg and E. S. Penczek (pp. 31-40) (N. Y. State Expt. Sta.); The Use of Corn Syrup Solids in Ice Cream and Ices, by L. R. Glazier and M. J. Mack (pp. 40-47) (Mass. State Col.); Use of Enzyme Converted Corn Syrup in the Manufacture of Ice Cream, Sherbets, and Ices, by P. H. Tracy (pp. 47-49) (Univ. Ill.); Factors Affecting the Viscosity and Coverage Value of Chocolate Coating for Ice Cream, by J. H. Erb (pp. 52-63) (Ohio State Univ.); Increasing Production per Kilowatts Consumed, by R. E. Miller (pp. 74-85); The Injection of Fruit and Syrups in Frozen Ice Cream, by A. C. Routh (pp. 90-94); Fitting Ice Cream in the Food and Drug Act, by C. M. Fistere (pp. 94-100); and The Application of Motion Pictures as a Medium in Showing the Influence of Several Factors Upon the Stability and Melt-Down Properties of Several Different Kinds of Ice Cream, by W. H. E. Reid (p. 101) (Univ. Mo.).

VETERINARY MEDICINE

[Work in animal pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 330 (1941), pp. 27-28, 39-40, 40-41*).—The work of the year reported upon (E. S. R., 83, p. 823) includes studies of bovine mastitis, by L. W. Slanetz; incidence of gizzard erosion, by T. B. Charles, J. H. Gillespie, and C. L. Martin; poultry autopsies; ruptured egg yolk and its control by breeding, by R. C. Durgin, Charles, Martin, and C. A. Botorff; and pullorum testing.

[Work in animal parasitology by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 128-136*).—A revision and extension by J. S. Andrews and J. F. Maldonado of data pertaining to the parasites of cattle, horses, and other animals as previously reported (E. S. R., 83, p. 677; 86, p. 87).

[Contributions on animal pathology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 15 (1940), No. 1-2, pp. 9-184, 261-277, 295-309, figs. 55*).—Among the contributions presented (E. S. R., 84, p. 814) are the following: The Study and Control of the Vectors of Rabies in South Africa, by P. S. Synman (pp. 9-140); Psittacosis in Domestic Pigeons, by J. D. W. A. Coles (pp. 141-148); The Susceptibility of Cattle to the Virus of Bluetongue (pp. 149-157) and Erosive Stomatitis of Cattle (pp. 159-173), both by J. H. Mason and W. O. Neitz; Rinderpest in Buffaloes—The Immunizing Value of Dried Goat Spleen Vaccine, by G. Pfaff (pp. 175-184); Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, X, by S. J. van der Walt and D. G. Steyn (pp. 261-277) (E. S. R., 84, p. 101); A Method for Preparing Sections of Bone Without Decalcification, by A. D. Thomas, R. Clark,

and K. Schultz (pp. 295-297); and Experimental Osteodystrophic Diseases in Goats, by J. W. Groenewald, A. D. Thomas, and B. A. du Toit (pp. 299-309).

Nutritional deficiency as a factor in the abnormal behavior of experimental animals, C. G. KING, H. W. KARN, and R. A. PATTON (*Science*, 94 (1941), No. 2434, p. 186).—A brief note.

The bracken problem, J. F. TOCHER (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 53 (1941), pp. 70-76).—A review of the progress of work with bracken poisoning, presented with a list of 41 references.

Diseases transmitted from animals to man, T. G. HULL (*Springfield, Ill.: Charles C. Thomas, 1941, 2. ed., pp. XIII+403, figs. 45*).—A revised edition of this work (E. S. R., 62, p. 668) in which the author has been assisted by 14 contributors. All chapters have been revised and brought up to date, and the chapters on animal parasites, fungus diseases, and psittacosis have been entirely rewritten. New chapters have been added on louping ill, sore mouth of sheep, equine encephalomyelitis, Rift Valley fever, typhus fever, and relapsing fever.

[**Contributions on animal parasitology**] (*Jour. Parasitol.*, 26 (1940), No. 6. Sup., pp. 14-45).—Among the contributions presented at the annual meeting of the American Society of Parasitologists held in Philadelphia, December 30 and 31, 1940, and January 1, 1941, abstracts of which are given, are: A Field Study of *Leucocytozoon bonasae* Clarke in Juvenile Ruffed Grouse (*Bonasa umbellus*), by E. C. O'Roke (p. 14); Duodenal Mucus of Fowls as a Nematode Growth Inhibitor, by J. E. Ackert and L. P. Frick (p. 14), and Intestinal Goblet Cells and Age Resistance to Parasitism, by J. E. Ackert and S. A. Edgar (pp. 14-15) (both Kans. State Col.); Studies of Phenothiazine and Related Substances as Anthelmintics, by P. D. Harwood, R. T. Haberman, and J. E. Guthrie (p. 15) (U. S. D. A.); The Influence of Biological Variation and Dosage-Time-Mortality Relationships on Anthelmintic Testing, by J. H. Whitlock (p. 15) (Kans. Expt. Sta.); Some Effects of Short Starvation Periods Upon the Fowl Cestode *Raillietina cesticillus* (Molin), by W. M. Reid (p. 16) (Kans. State Col.); The Occurrence of *Diocotophyme renale* in Dogs of North Carolina, by H. W. Brown, A. J. Sheldon, and W. W. Taylor, Jr. (p. 16) (Univ. N. C.); *Cephenomyia* in Virginia Deer, by S. Hadwen (p. 16); In Vitro Conditions Favoring Ecdysis at the End of the First Parasitic Stage of *Haemonchus contortus*, by N. R. Stoll (pp. 16-17); Studies on Bovine Gastro-Intestinal Parasites—V, Immunity to the Stomachworm *Haemonchus contortus*, With a Note on the Prepatent Period, by R. L. Mayhew, and VI, The Blood Picture in Stomachworm (*Haemonchus contortus*) Infections, by E. T. Delaune and R. L. Mayhew (p. 17) (both La. State Univ.) (see page 388); The Internal Parasites of Puerto Rican Cattle, With Special Reference to the Species Found in Calves Suffering from "Tropical Diarrhea," by J. S. Andrews (p. 18) (P. R. Sta.); Host-Parasite Relations of *Moniliformis dubius* (Acanthocephala) in White Rats and the Environmental Nature of Resistance to Single and Superimposed Infections With This Parasite, by P. L. Burlingame and A. C. Chandler (p. 18); Survival of Eggs of the Swine Ascarid in Cultivated Soil, by L. A. Spindler (p. 19), and Survival on Soil of Eggs of the Swine Thorn-Headed Worm *Macracanthorhynchus hirudinaceus*, by L. A. Spindler and K. C. Kates (p. 19) (both U. S. D. A.); Treatment of Canine Heartworm *Dirofilaria immitis* With Fuadin and Sulfanilamide, by H. W. Brown and A. J. Sheldon (pp. 19-20) (Univ. N. C. et al.); *Crenosoma mephitidis* in Dogs, by M. Hobmaier (p. 20) (Univ. Calif.); Permanent Stained Preparations of Thick Blood Films, by W. D. Gingrich (p. 20); A Preliminary Report of Human and Equine Encephalitis in Weld County, Colorado, in the Late Summer and Fall of 1940, by C. B. Philip, H. R. Cox, and J. H. Fountain (p. 24); The Relation of Vitamins B₁ and B₆ to *Eimeria*

nieschulzi Infection of the Rat, by E. R. Becker (p. 26) (Iowa State Col.); Studies on the Types of Cells Infected by *Leucocytozoon*, by C. G. Huff (p. 27); Virulence and Exoerythrocytic Schizogony in Four Species of *Plasmodium* in Domestic Ducks, by F. Wolfson (p. 28); Modifications of *Plasmodium cathemerium* in Canaries, Ducks, and Fowls, by R. Hegner (p. 28); The Effect of Intra-peritoneal Injections of Carbon Ink on the Course of *Plasmodium lophurae* Infections in Chickens, by W. Trager (p. 28); Culturing *Trichinella spiralis* in Vitro—I, Preliminary Experiments—A Basic Medium to Sustain Larvae Unchanged for Long Periods in Vitro, by A. J. Levin (p. 31); Effect of Roentgen Radiation on Embryonic Development of *Trichinella spiralis*, by A. J. Levin and T. C. Evans (p. 31); A Revision of the Subfamily Dicrocoeliinae Looss, 1899, With New Species From North American Birds, by J. F. Denton (p. 34); Beetle Supply in Experimental Fowl Taeniasis, by J. E. Ackert and A. A. Case (pp. 43-44) (Kans. State Col.); A Further Note on the Cultivation of *Taenia taeniaeformis* Larvae in Vitro, With a Preliminary Report on the Respiration of These Parasites, by J. H. Wilmoth (p. 44); The Effect of Host Vitamin E Deficiency on *Trichinella spiralis* Infections, by H. Zaiman (p. 44); and The Infection of *Anopheles quadrimaculatus* With a Monkey Malaria Parasite, *Plasmodium cynomolgi*, and With an Avian Parasite, *Plasmodium lophurae*, by L. T. Coggeshall (pp. 44-45).

Examination of grass and soil to determine the population of infective larval nematodes on pastures, G. P. KAUZAL (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 181-184, figs. 3).—It was found in an experimental study of grass plats contaminated with infective larvae of *Haemonchus contortus* that the examination of grass alone for the purpose of estimating the extent to which an area is infested is not sufficient. A maximum of only 16 percent was recovered from the grass, whereas the maximum from the soil was 75 percent. Considerable fluctuations in the number of larvae present in the soil and on the grass were observed and could be correlated with the existing weather conditions. The results also show that successful recovery of larvae from grass pasture is dependent on the presence of an optimal number of grass blades on which migration may take place, on favorable weather conditions, and on the vitality of the larvae.

Observations on the infection of chick embryos with Bacterium tularensis, Brucella, and Pasteurella pestis, G. J. BUDDINGH and F. C. WOMACK, JR. (*Jour. Expt. Med.*, 74 (1941), No. 3, pp. 213-222, pls. 3).—Experimental infection of chick embryos by the chorioallantoic route have shown *Bacterium tularensis* and *Brucella suis*, *B. abortus*, and *B. melitensis* to exhibit varying degrees of facultative intracellular parasitism. *P. pestis* is adapted to rapid proliferation and spread in the intercellular fluids. In the early stages of infection *Bacterium tularensis* has a marked affinity for growth within ectodermal epithelial cells. *Brucella suis* and *B. abortus* differ in their selectivity for cells of mesodermal derivation and especially in their effect on vascular endothelium. The strain of *B. melitensis* studied is limited in its intracellular growth to ectodermal epithelium. Many of the features characteristic of these infections in the natural hosts are reproduced in the chick embryo and its membranes. The possible implications regarding the differences in behavior of these micro-organisms in relation to the problem of infection and pathogenesis of the diseases are discussed.

Electrophoresis studies on Brucella, T. W. STEARNS and M. H. ROEPKE. (Minn. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 3, pp. 411-430, figs. 3).—It has been found that different strains of *Brucella* may show different variations of electrophoretic mobility with age of culture. Smooth strains of the bovine,

porcine, and caprine types have the same electrophoretic mobility value regardless of the animal species from which isolations were made. Recently isolated strains and laboratory strains recently passed through guinea pigs have slightly lower mobilities than those cultivated on media for a few transfers. A criticism of the literature on electrophoresis of bacteria is included. A review of the literature includes a list of 23 references.

Encephalitis in the Yakima Valley: Mixed St. Louis and western equine types, W. M. HAMMON (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 3, pp. 161-167, fig. 1).—Report is made of a survey conducted during the late summer of 1940 in the Yakima Valley, Washington, where in 1939 more than 600 cases of encephalomyelitis in horses and 31 cases of encephalitis in man were reported and encephalitis had again appeared in epidemic proportion. A diagnosis of encephalitis type B (St. Louis or equine or both) was definitely established in 58 of 86 reported cases. Clinical, epidemiological, and laboratory evidence all indicated the presence of both viruses, and it is thought probable that some patients had mixed infections. The blood serum of certain mammals and birds from the region showed neutralizing antibodies to one or both of these viruses.

Western equine and St. Louis encephalitis antibodies in the sera of mammals and birds from an endemic area, W. M. HAMMON, J. A. GRAY, JR., F. C. EVANS, E. M. IZUMI, and H. W. LUNDY. (Univ. Calif. and Wash. State Col.). (*Science*, 94 (1941), No. 2439, pp. 305-307).—Evidence obtained by Hammon as noted above led to the extensive survey in the same area in 1941 here reported upon. Commenced in May, the work was continued during the epidemic of that year. The serums from mammals and birds, both domestic and wild, were tested for the presence of neutralizing antibodies to both of these viruses and to certain others. It was decided that as a preliminary survey, approach through the neutralization test would yield more information regarding the extent of infection and possible reservoirs than a search for the actual viruses, since infection had never been manifested by any observed epizootic except in horses, thus differing from the eastern equine virus. Thus far, the serums of 162 birds and 153 mammals have been tested against the St. Louis virus and of 172 birds and 161 mammals against the equine virus. The results are tabulated for (1) domestic or captive and (2) wild birds and mammals.

It is considered probable that the antibodies found in many of the species recorded are the result of specific infection, probably of a mild or inapparent nature. For the St. Louis virus, 50 percent of 70 domestic birds showed protection as against 15 percent of 87 wild birds, and for the equine virus the respective percentages are 48.7 of 74 and 20 of 80. Of 77 domestic mammals tested, 37.7 percent protected against the St. Louis virus in contrast to 9.2 percent of 65 wild, and for the equine virus 32.4 percent of 71 domestic as against 5.1 percent of 78 wild. Caution is suggested in interpretation of these differences between the domestic and wild animal groups until both the areas of sampling and the species sampling can be more carefully analyzed. However, both the domestic and wild species were collected principally in areas where cases of encephalitis had occurred in 1939, 1940, or 1941. If the apparent significance of these findings is confirmed, it will indicate a much more widespread potential reservoir for both viruses than has generally been suspected, especially for the St. Louis virus. It would appear that barnyards and fowl runs, found in large numbers in small towns and rural and suburban areas, are the principal foci of infection for encephalitis of either the western equine or the St. Louis type. The distribution of human and obviously of horse cases has conformed with this pattern.

Isolation of the viruses of western equine and St. Louis encephalitis from *Culex tarsalis* mosquitoes, W. M. HAMMON, W. C. REEVES, B. BROOKMAN, E. M. IZUMI, and C. M. GJULLIN. (Univ. Calif., U. S. D. A., et al.). (*Science*, 94 (1941), No. 2440, pp. 328-330).—A preliminary report is made of the isolation of the St. Louis and western equine viruses of encephalitis from *C. tarsalis* taken in routine entomological collections in the Yakima Valley, Washington, where human encephalitis cases had occurred during the current or preceding year.

A note on variations in the efficiency of the copper sulphate and nicotine sulphate drench against *Haemonchus contortus*, H. M. GORDON and L. K. WHITTEN (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 172-176).—The repeated failure of individual sheep to respond to treatment with copper sulfate-nicotine sulfate mixture administered against *H. contortus* explains those instances in which outbreaks of haemonchosis are not satisfactorily controlled by repeated drenching with this mixture. This is thought to be due to the failure of the oesophageal groove to close in certain individuals. Such cases can be successfully treated with carbon tetrachloride.

The use of thallium acetate glucose broth in the diagnosis of streptococcal mastitis, D. A. MCKENZIE (*Vet. Rec.*, 53 (1941), No. 33, pp. 473-480, figs. 3).—The selective action of thallium acetate on pure cultures of various organisms is described and a comparison made with sodium azide, potassium tellurite, telluric acid, and thallium nitrate. Its action in the diagnosis of streptococcal mastitis in quarter and individual milk samples is reported upon. A medium containing thallium acetate, glucose, and crystal violet is recommended for such work, and a simple and rapid technic is described.

The transmission of Q fever by the tick *Rhipicephalus sanguineus*, D. J. W. SMITH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 19 (1941), No. 2, pp. 133-136).—It is concluded that the brown dog tick, which occurs in northern Australia on domestic animals, known or potential reservoirs of infection, may be a potential vector of so-called Q fever. "Larval, nymphal, and adult ticks were infected with Q fever by feeding them upon infected guinea pigs during the febrile period. The virus was passed from larvae to nymphs and from nymphs to adults, but not from the latter to their progeny. Infected nymphs and adults infected their host guinea pigs in 63 percent and 92 percent of cases, respectively. In infected ticks rickettsiae were seen only in the lumen and lining epithelium of the midgut. Invasion of the nuclei of infected cells was not observed. One-hundred-millionth of a gram of feces from infected ticks was found, 65 days after collection, to infect guinea pigs. Suspensions of rickettsiae suitable for agglutination tests were readily prepared from infected ticks."

The demonstration of non-specific components in *Salmonella paratyphi A* by induced variation, D. W. BRUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 4, pp. 461-478, figs. 2).

Selective action of sulfanilyl-guanidine on different *Salmonella* types and its practical importance, S. BORNSTEIN and L. STRAUSS (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 112-115).—In a study of the action of sulfanilyl guanidine, 74 types of organisms of the *Salmonella* group, 15 strains of *Escherichia coli*, 4 strains of *Shigella*, and a strain of *Aerobacter* were tested. "Of all the *Salmonella* organisms tested, only the typhoid bacillus (*S. typhi*), *S. paratyphi A*, and *S. choleraesuis* showed any marked degree of inhibition. Very slight inhibitory action was noted on *S. paratyphi C*, *S. abortus equi*, *S. sendai*, *S. gallinarum*, *S. muenster*, and *S. newington*. While *Aerobacter* was resistant and all 4 dysentery strains were strongly inhibited, the 15 strains of *E. coli* showed individual differences. In *Salmonella* organisms, however, no marked

differences between strains of the same type were noticed when 2 strains of *S. paratyphi* A, 7 strains of *S. choleraesuis*, 6 strains of *S. typhi*, and 10 strains each of *S. paratyphi* B and *S. typhimurium* were tested." The findings seem to indicate that sulfanilyl guanidine treatment of infections with *Salmonellas* other than the susceptible types may even be harmful.

Experiment in *Trypanosoma evansi*, A. R. KUPPUSWAMY (*Indian Vet. Jour.*, 18 (1941), No. 2, pp. 59-74, pls. 6, figs. 5).—Experimental work with *T. evansi* indicates that passage through the goat does not attenuate its virulence. The goat used in the experiment remained infective for a year, 8 mo., and 20 days. The mercuric chloride and Formal-Gul tests are considered of doubtful value when applied to the goat and calf.

Retained placenta, M. G. FINCHER. (Cornell Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 395-404, figs. 5).—Following a review of the theories regarding its etiology, the results of the treatment of 3,500 cases of retained placenta in cattle are discussed.

An extended study of female offspring of positive Bang's diseased cattle, C. P. FITCH, W. L. BOYD, M. D. KELLY, and L. M. BISHOP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 413-414).—Report is made of a 7-yr. study conducted in a herd of 56 females which was built up from dams that had positive reactions to the agglutination test for Bang's disease. Each calf was separated from the infected dam immediately and, except for nursing periods for 1 week, was put with the clean herd as soon as it showed a negative titer. It was then carefully observed through every lactation. In examinations of this herd *Brucella abortus* was not isolated from any of the milk, colostrum, placental membranes, vaginal discharges, fetuses, or calves that were examined shortly after birth. It is pointed out that this work confirms findings reported from the Oregon Experiment Station (E. S. R., 59, p. 778).

Preliminary trials on the administration of sulphonamide E. O. S. and of 4:4'-diaminodiphenylsulphone to normal cattle and to cattle affected with streptococcal mastitis, A. D. McEWEN, N. H. PIZER, and J. D. PATERSON (*Vet. Rec.*, 53 (1941), No. 30, pp. 429-436).—While 4:4'-diaminodiphenylsulfone was found to improve the clinical condition of the infected udder without producing any toxic symptoms, the experiments reported are considered insufficient to warrant definite conclusions regarding its value in the treatment of mastitis other than that for this purpose it is equal in value to and free from some of the objectionable properties of sulfanilamide.

A further note on diagnosis and treatment of bovine *Trichomonas* infection, W. M. SWANGARD (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 404-406, fig. 1).—A description is given of an instrument the use of which with a microscope of moderate efficiency makes possible the diagnosis of *T. bovis* (foetus) infection in the field.

Bovine trypanosomiasis in Panama, C. M. JOHNSON (*Amer. Jour. Trop. Med.*, 21 (1941), No. 2, pp. 289-297, fig. 1).—*Trypanosoma vivax* (*T. guyanense*, Leger and Vienne 1919), known for many years to exist in the countries south of Panama, was found by the author during the preceding 6 mo. to infect cattle in the central portion of Panama. It is concluded that the parasite had been introduced into Panama during the past 5 yr. through the importation of cattle from the countries to the south. A series of animals was inoculated with the parasite, but infections were successfully established only in calves, goats, and horses. The ordinary small laboratory animal was not susceptible. The trypanosome is well established in the local animals, as surveys of a number of herds revealed that from 5 to over 50 percent of their members were infected. The symptoms exhibited by the infected animals are not charac-

teristic. Fever, anemia, and emaciation are the most common manifestations, while, in some, weakness of the posterior extremities, edema, and loss of appetite are sometimes present. Diagnosis is best accomplished by thick blood smear methods and by gland puncture.

Studies on bovine gastro-intestinal parasites.—III, The blood picture in hookworm and nodular worm infection, with some observations on the normal, E. T. DELAUNE and R. L. MAYHEW. (La. State Univ.). (*Amer. Micros. Soc. Trans.*, 60 (1941), No. 3, pp. 293-308, figs. 3).—In continuation of this work (E. S. R., 84, p. 394), report is made of a study of the erythrocyte, leucocyte, and differential cell values as found in two calves infected with nodular worms (*Oesophagostomum radiatum*) and three infected with *O. radiatum* and hookworms (*Bunostomum phlebotomum*). Data are given on the complete blood picture of normal healthy castrated males on pasture and healthy cows in a dairy herd at Baton Rouge, La., for comparison with the experimental animals. A bibliography of 36 titles is included.

Studies on bovine gastro-intestinal parasites.—IV, Influence of hay consumption on egg counts, R. L. MAYHEW. (La. State Univ.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 495-498, figs. 5).—In continuation of the above, data are presented which indicate that the amount of hay consumed influences inversely the number of nematode eggs counted per gram of sediment. Eight instances in five calves of increased egg count due to reduction of the amount of hay consumed are reported. The time required to affect the change in count after the change in amount of hay consumed is usually 1 to 3 days according to the data obtained.

The value and relative effectiveness of preparations of rotenone, derris powder, and cube powder as larvicides for cattle grubs, C. E. SMITH, E. LIVENGOOD, and I. H. ROBERTS. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 391-394).—Experiments conducted in the vicinity of Colorado Springs, Colo., during the grub seasons of 1938 and 1939 and in north-central Missouri in 1940 are reported. Chemically pure rotenone and a preparation containing 90 percent of rotenone used in the form of washes and applied to infested cattle once during the grub season were not as effective in killing cattle grubs in situ as derris or cube washes. Standardized commercial derris powder and cube powder used in the form of washes were equally effective in killing cattle grubs in situ, and derris powder and cube powder classed by the manufacturer as containing 4 percent of rotenone were as effective in killing cattle grubs as like powders said to contain 5 percent of rotenone. Washes made in the proportion of 12 oz. of derris or cube powder to 1 gal. of water were as effective as those made in the proportion of 16 oz. to 1 gal. Washes containing 8 oz. of derris or cube powder to 1 gal. of water were not fully effective, but washes made in the proportion of 4 oz. of soap dissolved in 1 gal. of warm water and 12 oz. of either derris or cube powder proved to be safe and effective. Single treatments of infested cattle with derris or cube washes containing 12 oz. or more of powder to 1 gal. of water and applied about 30 days after the first grub openings killed from 90 to 100 percent of the grubs appearing in the treated cattle during the grub season. One treatment a season with derris or cube washes can not be depended upon to eradicate grubs of *Hypoderma lineatum*, but it can be depended upon to effect a fair measure of control. Cattle were not visibly injured in any way by washes applied during cold weather.

Cattle spray testing, F. C. NELSON (*Soap and Sanit. Chem.*, 17 (1941), No. 8, pp. 92-97, 119, 121, fig. 1).—This contribution is presented with a bibliography of 76 titles.

Studies on deglutition in sheep (*Austral. Vet. Jour.*, 17 (1941), Nos. 2, pp. 52-58; 4, pp. 137-142).—The first of these papers is A Résumé of Observations on the Course Taken by Liquids Through the Stomach of Sheep at Various Ages From Birth to Four Years, by R. H. Watson; the second is A Résumé of Observations on the Influence of Copper Salts on the Course Taken by Liquids Into the Stomach of the Sheep, by R. H. Watson and I. G. Jarrett.

A filterable virus demonstrated to be the infective agent in ovine balanoposthitis, E. A. TUNNICLIFF and P. H. MATISHECK. (*Mont. Expt. Sta.*). (*Science*, 94 (1941), No. 2438, pp. 283-284).—In their studies of this disease of sheep the authors succeeded in the preparation of infective, bacteria-free filtrates. A description is given of the technic by which such filtrates were obtained. Typical lesions were produced on the prepuces of experimentally inoculated rams with each of four filtrates prepared. The disease was again transmitted to healthy experimental rams by prepuce inoculations with virus suspensions from two of the filtrate-produced cases.

A study of the blood picture of lambs suffering from parasitic gastritis, H. H. HOLMAN and I. H. PATTISON (*Vet. Rec.*, 53 (1941), No. 34, pp. 491-498, figs. 3).

The use of phenothiazine for the control of oesophagostomiasis (nodule worm disease) of sheep, H. M. GORDON (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 166-172, figs. 2).—A discussion of the use of phenothiazine in the control of *Oesophagostomum columbianum*, one of the most important parasites of sheep in eastern Australia.

Pining in sheep: Its control by administration of cobalt and by use of cobalt-rich fertilizers, J. STEWART, R. L. MITCHELL, and A. B. STEWART (*Empire Jour. Expt. Agr.*, 9 (1941), No. 34, pp. 145-152).

Cultivation of the hog cholera virus, C. TENBROECK (*Jour. Expt. Med.*, 74 (1941), No. 5, pp. 427-432).—The author has readily confirmed the work of F. Hecke³ on the cultivation of hog cholera virus. It was grown in the presence of fresh minced swine testicle in flasks containing Tyrode solution, on the chorioallantoic membrane of embryonated eggs, and on the surface of swine serum agar. "In flasks it was grown for 14 transfers, while on eggs it was grown for 13 transfers, followed by an equal number of transfers on agar, making 26 transfers in all. Only one strain of virus was used, and we do not know whether all strains can be cultivated so readily or whether we were particularly fortunate in the selection of the strain used. Neither do we know whether swine testicle is better than other tissues for growth.

"The cultured virus produces characteristic hog cholera when injected into swine, and its effect can be neutralized with commercial anti-hog-cholera serum. No evidence of attenuation of the virus was obtained, the last culture being highly virulent when small amounts were injected. No evidence for the adaptation to the egg could be secured, since passages without swine testicle on the membrane or intravenously for 2 transfers resulted in a loss of the virus. No contaminating virus that might favor the cultivation could be detected by animal or egg inoculation.

"Not only has the virus been cultivated, but it has been demonstrated in large amounts in the culture. Four suspensions containing slightly over 0.5 mg. of protein nitrogen produced typical hog cholera when 1×10^{-6} cc. was injected, and one suspension made in the same way was active in one-tenth this amount. Few titrations on what is commonly known as hog cholera virus, i. e., the serum from acutely ill pigs, are available. We made one such titration and produced a delayed disease with 1×10^{-5} cc. of infectious serum. It seems probable that

³Zentbl. Bakt. [etc.], 1. Abt., Orig., 126 (1932), No. 7-8, pp. 517-526, figs. 3.

the culture virus is more active than the commonly used virus, and that its practical use in hog cholera vaccination and hyperimmunization would result in a considerable saving. All of the methods used yielded active cultures, but the serum agar method is the one of choice since larger amounts of suspension can be obtained with less labor."

Diseases of swine due to nutritive deficiencies, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 373-381).

Sulphanilamide in the treatment of equine diseases, S. L. HIGNETT (*Jour. Roy. Army Vet. Corps*, 12 (1940), No. 1, pp. 3-16).—This discussion is presented with a list of 35 references to the literature.

Treatment of Percheron horses for gastrointestinal parasites with a phenothiazine-carbon disulfide mixture, L. E. BOLEY, N. D. LEVINE, W. L. WRIGHT, and R. GRAHAM. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 408-411).—In the treatment of 24 Percheron horses for gastrointestinal parasites, a mixture of phenothiazine (40 gm.) and carbon disulfide (24 cc.) was administered in capsules following a 36-hr. fast without clinical evidence of illness. Pre- and post-treatment fecal egg counts indicated that ascarid and strongyle eggs were eliminated or greatly reduced, and these two parasites as well as bots were observed in the feces of the horses following treatment. Pre- and post-treatment examination of blood and urine of the treated horses revealed no significant evidence of anemia or kidney damage.

Experiments with phenothiazine in the treatment of horses for strongyles, V. B. ROBINSON and J. M. KAYS. (Univ. Mo.). (*Vet. Med.*, 36 (1941), No. 11, pp. 557-559).—The treatment of horses with phenothiazine in January 1941 for removal of strongyles was followed by egg counts which indicate that this anthelmintic is fairly effective in doses as small as 25 gm.

The susceptibility of dogs to virus of equine encephalomyelitis (western), C. F. SCHLOTTHAUER (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 388-390, figs. 2).—In transmission work it has been demonstrated that some dogs are susceptible to the western type of the virus of equine encephalomyelitis. In two of three young dogs inoculated intracerebrally with 0.5 cc. of a dense suspension of infected guinea pig brain, and in one of six young dogs inoculated in the pad of the right hind foot with 1 cc. of a similar suspension of brain, disseminated encephalitis developed and the dogs succumbed. The lesions noted microscopically in the brain were characteristic of those caused by neurotropic viruses.

A report on the failure of phenothiazine as an anthelmintic against the common nematodes of dogs in Australia, G. P. KAUZAL and L. K. WHITTEN (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 185-187).—In tests conducted, phenothiazine in single doses of from 1 to 10 gm. or repeated doses of from 1 to 3 gm. was found to be erratic and generally unsatisfactory against the ascarids of dogs. It was usually ineffective against *Ancylostoma* and was almost completely so against *Trichuris*.

Changes occurring in the blood and tissue of chickens during coccidiosis and artificial hemorrhage, S. H. WAXLER. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 134 (1941), No. 1, pp. 19-26, fig. 1).—Studies of the blood of chickens affected with cecal coccidiosis indicated: "(1) There is an increase of the blood chloride on the sixth and seventh day of an infection of cecal coccidiosis in chickens. (2) The rise in the blood sugar, due to coccidiosis, is apparent on the fifth day, a day prior to the rise of the chlorides. (3) Artificial hemorrhage produces an increase in the blood chloride and sugar approximate to that brought about by bleeding from coccidiosis. (4) The chloride content of the blood is maintained at the normal level after severe artificial hemorrhage

by the injection of 6 percent sodium chloride-free gum acacia solution. (5) The chloride content of the muscle shows a downward trend during coccidiosis and may account in part for the rise in the blood chloride."

Gizzard erosion as a disease problem in the field, H. R. BAKER and L. M. GREENE (*Poultry Sci.*, 20 (1941), No. 5, p. 455).—Erosion of the gizzard lining of nutritional origin was diagnosed in Delaware in August, September, and November, 1939, as present in over 50 percent of the flocks serviced. Growth was affected, heavy mortality resulted, and many of the recovered birds that had been severely affected were permanently stunted. Over 500 chicks succumbed in a flock of 6,000 during a 24-hr. period. Although not supported by laboratory results, field experiences are considered to justify the conclusion that gizzard erosion in day-old chicks and sexually mature fowl does occur alone, stunts birds, and at times causes heavy mortality. In uncomplicated cases recovery is evident soon after treatment is started.

The fowl leukosis battle, C. D. LEE and A. J. G. MAW. (Iowa State Col.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 10, pp. 588-591, 629, figs. 2).—It is concluded that a thorough culling and breeding program will control this major disease of poultry.

Twenty-first annual report on eradication of pullorum disease in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 108 (1941), pp. 11).—Report (E. S. R., 84, p. 107) is made of the results of eradication work conducted during the 1940-41 season. A total of 538,589 blood samples from 527,328 birds in 309 flocks in 11 counties were tested, with 0.09 percent reacting positively, the lowest in the testing history. In 6 counties all the tested flocks were classified as nonreacting. No reactors were detected among flocks tested in Worcester County, which led in the number of tested birds (89,041). Fewer "breaks" were encountered than during the preceding season. The details are given in accompanying tables.

Post-mortem changes in New York dressed poultry at 35° F., G. F. STEWART, B. LOWE, and M. MORR. (Iowa Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 9, pp. 542-544, 571-572, figs. 4).—A study.

Studies on the gapeworm *Syngamus trachea* (Montagu, 1811) in robins and chickens, R. C. RIPPLE. (Univ. Nebr.). (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 369-374).—About 33 percent of 76 robins collected at Lincoln, Nebr., were found infected with gapeworms which morphologically could not be distinguished from *S. trachea* of domestic poultry. Several attempts to infect chickens with recently incubated eggs from the robin gapeworm were unsuccessful, but earthworms of the species *Eisenia foetida* that were fed incubated eggs of the robin gapeworm produced an infection in one of six chickens. Eggs of the robin gapeworm kept in cold storage for 6 mo., then incubated and fed in large numbers, resulted in infections in two of six chickens. The author emphasizes the fact that, while cross-infection experiments confirm the identity of the robin and chicken gapeworms, because of the difficulty of cross-infection it is by no means certain that such transfers occur in nature.

Observations on intestinal worms in a young robin (*Turdus migratorius*), C. B. WORTH (*Bird-Banding*, 12 (1941), No. 4, pp. 175-176).—The infestation of a young robin by spirurid and ascaroid nematodes, tape-worms, and Acanthocephala is reported.

Blood parasites of birds of the District of Columbia and Patuxent Research Refuge vicinity, P. W. WETMORE (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 379-393).—In the course of work commenced in the summer of 1938, blood parasites were found in 30 percent of the 618 birds collected in the District of Columbia and examined. Six genera of parasites found in a total of 268 infections are reported upon.

3,000 wild bird autopsies on western lake areas, E. R. QUOTRUP and J. E. SHILLINGER (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 382-387, figs. 4).—The results of 3,000 post-mortem examinations made at the Bear River Wildlife Disease Research Station in Utah during 4 yr. of research that dealt primarily with botulism of waterfowl are reported. Botulism was the cause of 47.9 percent of the deaths, mechanical injury, including gunshot, 18.5 percent, and lead poisoning 8.6 percent, with the remainder due to at least 20 different causes. It is pointed out that wild species are probably subject to as great a variety of disease conditions as are domestic poultry, and that they are less tolerant of autopollution and unhealthful environments than are farm flocks.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the New Hampshire Station**] (*New Hampshire Sta. Bul.* 330 (1941), pp. 20-21).—This report notes work by W. T. Ackerman on the design of small potato storages for farm use, and on dehydration and processing of medicinal herbs, a drier capable of dehydrating 200 lb. of green material to U. S. P. specifications in from 30 to 60 hr. having been constructed.

Runoff from small agricultural watersheds, D. W. CARDWELL (U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 479-481, 482, fig. 1).—This paper, pointing out the now recognized inadequacy of the coefficient C in the run-off equation $Q=CIA$ and the lack of coefficients for various soil, slope, and cover conditions, presents analyses of the available results (those of the period from August 1, 1938, to September 30, 1939) of work on three watersheds at Danville, Va., and on four watersheds at Americus, Ga., with a tabular summary of the characteristics of the watersheds concerned. It is shown that one of the difficulties standing in the way of obtaining accurate figures by means of the CIA formula lies in the fact that the so-called time of concentration—the time required, under fairly constant rainfall, for all parts of the watershed to contribute to the flow—can be determined only in very few rains, most storms failing to meet the conditions required for such a determination. It is considered that definite recommendations for practical applications cannot be made without further study of the results thus far secured and yet to be obtained. The preliminary results as discussed, however, serve to indicate the wide differences which may be expected between the run-off capabilities of various problem areas and to emphasize the need for additional investigation.

Terrace dimension changes and the movement of terrace ridges, L. H. SCHOENLEBER (U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 477-478, fig. 1).—Results of 8 years' study of terrace stability at the Soil Conservation Service experiment station near Clarinda, Iowa, are discussed. The slope ranged from 6 to 11 percent. Effects of various crops and tillage practices were considered. Terrace cross sections were made on nearly 10 miles of terrace at each 100 ft. and elevations taken at low point in channel and high point of ridge at stations 50 ft. apart, and nearly 4,000 ft. of soil-movement lines were established at right angles to terrace ridges from the top to the bottom of the slope.

Terrace dimension changes when various crops are grown are due primarily to the methods and type of tillage operations performed. Average terrace cross section will probably increase when all tillage operations are performed parallel to the terrace ridge and when plowing is performed by backfurfrowing to ridge, leaving dead furrow in the channel and throwing all furrows uphill. The two different surveys employed to determine terrace dimension changes proved

satisfactory. However, only two dimensions, terrace cross section and terrace ridge height, could be determined from the terrace-section survey. Terrace ridges do not creep down the hill slope and do not change their relative locations with respect to other terraces under farming practices similar to those used. With proper farming practices, adequate terrace cross sections can be maintained which will avoid the necessity of separate operations to maintain or rebuild terraces.

Maintenance of open drainage ditches, E. A. KREKOW. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 7-8, figs. 2).—This brief discussion is concerned mainly with ditches primarily intended as tile-drainage outlets and as auxiliary surface drainage. It is based principally upon study of drainage problems and conditions in Kossuth and adjoining counties in Iowa. A revision of drainage laws, including a consolidation of districts or a larger taxing base, with perhaps even the entire county as a unit, is considered needful. A small annual levy in lieu of the special assessments as now spread is desirable, together with interchange of equipment between drainage districts and county road maintenance departments on a rental basis, permanently appointed drainage maintenance engineer whose duties would be similar to those of the present county engineer with relation to roads, and good land use practices, best accomplished by cooperation between the drainage engineer and the county agent, as well as cooperation with State and Federal agencies.

Hydraulic tests of kudzu as a conservation channel lining, W. O. REE. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 27-29, figs. 4).—Kudzu, or *Pueraria thunbergiana*, is a prolific perennial of dense foliage, rooting under favorable conditions wherever a node touches the ground and suitable for planting in the southeastern United States. Data concerning the hydraulic and protective characteristics of kudzu as a drainage channel lining were obtained in tests made at various times in one experimental channel, 50 ft. long, bottom slope 3 percent, bottom width 4 ft., and side slopes of 1 vertical to 1.5 horizontal. The channel was made in Cecil subsoil and lined with Cecil sandy loam topsoil, treated with 700 lb. complete fertilizer per acre and planted to kudzu crowns on rectangles 1.5 by 1 ft. about 2 weeks later. The first tests were run 8 mo. after the planting. In the second year of growth tests were run in August, the vines being green, and in the following February when the plants were dormant. Probable safe design velocities for channels protected by live second-year growth and by dead second-year growth were determined at 4 and 2.5 ft. per second, respectively. A tabular summary of hydraulic data includes the retardance coefficient, n , as used in the formulas both of Kutter and Manning. These data cover five runs in each of the three tests noted above.

The sanitary evaluation of private water supplies, R. L. FRANCE (*Massachusetts Sta. Bul.* 383 (1941), pp. 11).—This is a popular outline of the subject of the pollution and contamination of spring and well waters, their protection from the entrance of substances rendering them unfit for human consumption, and their bacteriological examination for the detection of pollution and contamination. It is noted that but two diseases (typhoid fever and dysentery) are known to have been spread by water-supply contamination in Massachusetts, and that contamination of rural private water supplies with the organisms of either disease has ceased to be a public-health problem in the State. It is the purpose of the present bulletin to give information concerning some aspects of the subject of water contamination and testing which have been little known or little understood by the general public.

Efficiency of various building materials for dairy barns (*Vermont Sta. Bul.* 475 (1941), p. 28).—This report by H. B. Ellenberger briefly notes moisture-

gage studies of wooden sheathing in side walls and ceilings; tests of numerous ceiling materials, of which only the corrugated iron showed deterioration (apparent corrosion spots not red rust); work on cow-stall floorings, indicating that sawdust concrete requires much longer curing before use than does sand concrete, while the other floorings tested showed no wear after one winter of use; and trials of ventilation by electric exhaust fans, in which wide variations in the relative humidity in the barn so ventilated were discovered.

A portable charcoal kiln, using the chimney principle, A. R. OLSON and H. W. HICOCK (*Connecticut [New Haven] Sta. Bul. 448 (1941), pp. 483-513, figs. 14*).—The kilns described represent an adaptation of the chimney principle as developed by Swedish engineers to the manufacture of charcoal in a portable apparatus. The results constitute a compromise between a design which theoretically should produce the best results and one suitable to conditions in this country, in particular one which requires a minimum of expense to build and to operate.

The principal advantage in the use of the chimney in conjunction with localized air inlets lies in the fact that, once the coaling of the charge is well under way, little further attention is needed until the kiln is ready to close at the end of the burn. The use of a chimney on a four-cord, cylindrical, metal kiln was not considered satisfactory because of the considerable expense in constructing the internal duct system needed to admit air and emit smoke, and in building and charging cylindrical or dome-shaped kilns. A chimney is used on the rectangular kilns, but there is no internal-duct system other than that made when stacking the wood. Construction is consequently much simplified. One disadvantage of the rectangular shape is the care needed in order to get a good spread of fire over the rear-end panel. The wider this panel, the more attention required. It is believed that a four-cord kiln 6.5 ft. high, 5.5 ft. wide (to accommodate 5-ft. wood), and 16 ft. long would be much easier to handle than the four-cord kiln described above. Detailed bills of materials and complete sets of working drawings for both the one-cord and the four-cord kiln are included, together with full directions and time schedules for operation.

Oil filters for internal combustion engines, C. W. SMITH, T. B. JOHNSON, and E. L. MUNTER (*Nebraska Sta. Bul. 334 (1941), pp. 58, figs. 71*).—A brief introduction defines the full flow and bypass methods of installation, the various filtering principles represented by commercial filters, and centrifugal, centripetal, and parallel flow through the filtering element, and describes the various filtering materials currently used.

The filter testing equipment is described in detail. Tests using 11 lb. of oil as a standard charge are reported. Bus crankcase oil was used as the dirty oil for these tests, and the first tests were made by starting with dirty oil. Later tests were made by starting with clean oil and comparing the ability of the various filters to keep it clean while an addition to the testing unit slowly added dirty oil. Methods used for tests and analysis of the oil during test runs are described, and photographs of hourly spot tests from 1 to 20 hr. indicate the oil-clearing performances of each of 30 filters. Performance as measured by various other criteria is shown in charts and tables.

A great variation in the efficiencies of oil filters was found. Large filters were more efficient than small ones. The rate of flow of oil through filters varied greatly. In the filters tested there was no close correlation between rates of flow and filter efficiencies.

A simple dynamometer, M. A. SHARP. (Univ. Tenn.). (*Agr. Engin., 22 (1941), No. 1, p. 32, fig. 1*).—A cable is wound around a drum made of two automobile rear-wheel assemblies with the hubs turned in and the wheels removed,

and one end is anchored to a post. As the team pulls the cart forward the cable causes the drum to rotate, the axle operating an automobile jack which tightens the brakes. The pull against compression springs operates a recording lever on the dial. The maximum pull is recorded. Continuous recording devices may be added at very little cost. Material for this instrument was obtained at a junk yard. A diagram showing its mode of operation accompanies the note.

The electric ultramicrometer circuit as a drawbar dynamometer, G. W. GILES. (Univ. N. C.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 469-471, figs. 2).—The drawbar pull to be measured is made to effect a proportional separation of the plates of a condenser connected across an inductance, one-half of which (150 turns 3.5 in. in diameter) is included in the grid circuit of a three-element tube. The plate circuit includes the other half of the inductance and a milliammeter reading from 0 to 1 ma. and protected by a 0.01-a. fuse. A C battery is also connected across the meter to oppose the plate current. This is controlled by 1,000- and 10,000-ohm resistances in parallel, completing a zero shunt and permitting adjustment of the meter to zero reading. The meter having been thus adjusted, any separation of the condenser plates by drawbar pull will lower C by increasing D in the well-known relation $C = \frac{KA}{4\pi D}$, thereby raising the frequency, and concomitantly the plate current and the meter reading may be calibrated in terms of drawbar pull. A drawbar condenser weighing 15 lb. and satisfactory for the range from 0 to 2,900 lb. of pull was constructed from two heavy flat springs attached at the ends to form two simple restrained beams carrying the insulated condenser plates and having the load attached at the center. The condenser plates were of steel, about 4.75 in. square, and insulated against direct contact by shellacking their opposed surfaces. Placing the plates too close together prevented oscillation, as did also an excessive spacing (approximately 0.25 in. and over). Advantages and disadvantages of this system of measurement are discussed.

A head thresher for plant breeding studies, J. ROBERTS. (Kans. State Col.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 14, 32, figs. 3).—To avoid mixing of samples it was necessary so to design the machine as to prevent throwing of corn into the air and lodging of kernels at any point inside the thresher. These requirements, and those of simplicity, ease of cleaning, durability, and portability, were met by a design using two steel pipes, the smaller one serving as the cylinder, the larger providing the concaves and framework. For the cylinder a 5-in. heavy steel pipe was selected, and for the concaves an 8-in. heavy steel pipe. Second-hand pipe could be used, as it was necessary to machine each pipe to insure proper balance and smoothness. Cast-iron end plates were used on each cylinder to insure tightness and cylinder balance. The clearance between the end plates of the large and small cylinder was $\frac{1}{64}$ in. This close fit prevented grain from sticking between the end plates. Teeth for the cylinder and concave were made from $\frac{1}{4}$ -in. steel cap screws. The location and spacing of the cylinder and concave teeth are shown, together with other constructional detail, in a dimensioned drawing and two photographs. One of the photographs shows an improvised blower separator attachment. A small feed opening and tall feed hopper provide against overloading and hand injury.

Equipment for cultivating corn, C. K. SHEDD and E. V. COLLINS. (Iowa Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 5-6, figs. 5).—The time and nature of seedbed preparation was studied, and the effects upon yields resulting from the use of various machines for early cultivation were compared.

For planting from May 10 to 15, one thorough tillage with tandem disk harrow and spike-tooth harrow just before planting was sufficient to destroy weed growth. Additional tillage prior to that time did not benefit weed control nor germination and growth of the corn. For early cultivation sweeps and disk hillers were found preferable to pointed shovels for use on tractor cultivators. Sweep tracks overlap so that all weeds in the space between the rows are sheared off without deep cultivation. Sweeps were found to give less trouble than pointed shovels by clogging with cornstalks or other trash embedded in the soil. Sweeps throw less soil than do pointed shovels, but they could be adjusted to move enough soil into the corn row to cover ordinary weed growth at the first cultivation. For the last cultivation the equipment generally found most effective was one pair of disk hillers and two pairs of sweeps per row. For killing morning-glory vines, two pairs of disk hillers and one pair of sweeps per row were the most effective equipment. The front pair of disks throw soil away from the corn row, the second pair throw soil back into the corn row, and the sweeps cut the remaining space between rows. The best rear attachment for a tractor cultivator was an experimental spring-tooth weeder. This attachment consists of weeder teeth set in lines at about a 45° angle with the corn row. The teeth in this position move loose soil away from the corn row, fill tractor-wheel tracks, and leave the space between rows nearly level. They do not disturb the soil placed in the corn row to cover weeds. The weeder teeth complete the kill of weeds by raking them to the surface. By changing the spacing of the teeth for various conditions, excessive accumulation of weeds or trash on the teeth can be prevented. This weeder-tooth rear attachment was found to reduce the ridging of rows and eliminate any furrow between rows which might interfere with guiding the tractor at the next cultivation or at harvest. For check-rowed corn the reduced ridging makes the tractor and cultivator ride more smoothly and do better work in crossing ridges.

Seed corn grading in relation to planting, A. H. WRIGHT. (Univ. Wis.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 18, 24).—The author finds all three dimensions of the corn seed to be related to planting accuracy and plate design and adds length grading, which is new, to grading according to width and thickness. To cover all varieties of seed produced in Wisconsin 19 grades were required, 3 length grades having been set up, although it was found that 2 length grades only were required for any one variety. Of planter plates three types are briefly discussed, the first named being the round-hole, hill-drop plate which will do fairly well with even poorly graded seed. An available plate of this type will handle with fair accuracy any of the 19 Wisconsin grades. Of the edge-drop plate it is noted that, although it is very accurate when new, it becomes inaccurate through wear of the containing rim by soil particles and through bearing wear. Of the third type, described as an enclosed-cell, single flat-drop plate, the author states that, although satisfactory accuracy is obtained with the grades for which plates are now available, the present range of plates is too limited.

Electrical weed control, E. M. DIEFFENBACH. (U. S. D. A. coop. Utah Expt. Sta.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 486, 488).—The experiments here reported upon were confined mainly to rootstalks of bindweed or wild morning-glory (*Convolvulus arvensis*). The resistivity of the rootstalks of this weed ranged from 1,500 to 5,000 ohms per centimeter, the mean value being about 2,500. Soil taken from a field of the weed which had received neither irrigation water nor rain for 3 weeks showed a resistivity of from 100,000 to 200,000 ohms per centimeter, while soil having a moisture content about right for planting (16 percent) had a resistivity of from 20,000 to 25,000 ohms. It is concluded that in soil which is at all dry, current applied would follow the

rootstalks. A current of 10 ma. was found sufficient to kill any of the rootstalks tested. In terms of current density, 0.2 a. per square centimeter might be required. Slightly less of D. C. than of A. C. was required.

New developments in forage harvesting machines, F. W. DUFFEE. (Univ. Wis.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 11-13, 17).—The author emphasizes the importance of the forage harvester as a final step in the development of mechanized agriculture, insofar as the three major crops outside the Cotton Belt (hay, grain, and corn) are concerned. As here used, the term "forage-crop harvesting" includes the handling of grass silage, dry hay, and straw, behind the combine. Whereas the field baler merely bales hay and straw, dropping the bales to the ground, the newer machine, which is relatively low in cost, will pick up, chop, and load hay and straw, harvest grass silage, and serve as a stationary silage cutter for corn, if not a field silage corn harvester. The author stresses the importance of devising a practical attachment converting the forage harvester into a silage corn harvester. He points out also various modifications of design which should be made in the small grass-silage harvester and features to be desired in related machines and accessories.

The drying of grasses, R. M. RAMP. (Univ. Del.). (*Agr. Engin.*, 21 (1940), No. 12, p. 472, fig. 1).—Artificial drying of immature pasture herbage in a two-tray batch drier, followed by baling, gives a product which retains most of its original green color. More dry matter can be obtained per acre per year by frequent clipping and drying than by harvesting grass as sun-cured hay, and frequent clipping of the immature grasses increases the acreage yields of protein from 40 to 50 percent over that recovered by the usual haymaking procedure. More than five times as much carotene was preserved through artificial dehydration as by field curing. Reduction of moisture in the grasses below 10 percent by artificial drying is valueless. Loss of carotene during the storage in bales is most rapid during the first few months, particularly in hot weather, and averaged 50 percent during the 10-mo. experimental period, but the final product still contained from two to five times as much carotene as was found in hay at time of storage. The results obtained from the artificial drying of grass are very favorable, but the equipment cost at the present time makes it prohibitive as a universal practice in Delaware. One may reasonably expect, however, enough improvement in the grass-drying equipment and methods to overcome the present high cost of drying grasses.

Research work in wheat storage, C. F. KELLY. (U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 473-475, 476).—Work on bin construction and ventilation and on drying of grain before storage, carried out in cooperation with various State experiment stations, is summarized. A fuller account of some of the work on bins and bin ventilation at the North Dakota Station has been noted (E. S. R., 86, p. 101), and a drier developed at the University of Maryland is described below. Another type of machine, developed by the U. S. Department of Agriculture, heats the grain by direct contact with the inside of a drum revolving in a heated oven. The wet wheat, heated to a temperature of about 140° F., passes by gravity down between two screens spaced about 6 in. apart, where it receives a blast of cool air. The wheat is in the air flow for a period of from 8 to 10 min., in which time it is both cooled to air temperature and dried. The experimental model, mounted on a truck, will dry 16-percent wheat to 14 percent at the rate of 100 bu. per hour. Oil is used for fuel.

Engineering problems in grain storage, G. J. BURKHARDT. (Univ. Md.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 485, 488, figs. 3).—A relatively humid climate makes dry wheat at harvest difficult or impossible and creates a storage problem. The investigation here reported upon has indicated that (1) no

ordinary structure will safely store high moisture-content wheat, (2) additions of preservatives do not appreciably improve the keeping quality of wheat, though the addition of lime and sulfur has kept a bin of 15-percent wheat from souring since 1937 while similar wheat without the addition turned sour in the spring of 1938, and (3) ventilation properly installed will aid in keeping such wheat but it is doubtful whether the expense and inconvenience of the ventilating system are justified considering the results obtained in the humid climate of this region. A new grain drier was therefore developed. It is compact enough to provide reasonable capacity in a portable machine. In its elementary parts this drier consists of a grain hopper, an air vent, several extended surface heating coils with a diffusion space between them, a cooling space, screened air inlets, an air-resistance leg, and a variable discharge mechanism. Auxiliary equipment includes a fan, a hot water supply, and a suitable power for driving the equipment. A machine of this basic design can be built to any size and capacity desired. For the 1939 harvest a portable unit having a coil-face area of 8.25 sq. ft. was built. A loading elevator and bagger reduce the labor required to a minimum. In this machine air vents, screened air inlets, and discharge mechanism are in multiple to eliminate funneling. By varying the rate of discharge, the moisture reduction can be adjusted to the needs of the lot of grain. One lot of wheat was dried from 24.2 to 16.4 percent moisture at 24 bu. per hour. Another was dried from 18.5 to 14 percent at 40 bu. per hour. From 24 to 120 bu. per hour can be handled, depending on the moisture reduction required.

Results of investigations of milk cooling, J. ROBERTS and G. H. LARSON (*Agr. Engin.*, 21 (1940), No. 12, pp. 465-467, 471, figs. 12).—The information here presented was obtained from answers to a questionnaire prepared by the Kansas State College and the Kansas Committee on the Relation of Electricity to Agriculture and the results of a survey covering more than 1,000 individual producers. Of the producers covered by the survey, 25 percent were classed as Grade A, 74 percent as Grade B, and 1 percent as Grades C and D. Electricity was available to 67 percent, but only 20 percent used mechanical milkers. No milk-cooling method was used by 24 percent of the producers, well water (of a mean temperature from 56° to 64° F.) by 40 percent, and mechanical refrigeration by 24 percent. Of the mechanical refrigeration 28 percent was wet storage, 48 percent dry box, and 24 percent dry walk-in box. Field and laboratory tests of cooling rates made by means both of thermometers and of thermocouples are also reported.

Cold air was found nearly worthless for cooling milk in 10-gal. cans. Water at 60° or below may be considered satisfactory for producing Grade B milk. In using well water for cooling 10-gal. cans, the cooling rate may be doubled by stirring the milk three times during the first hour. The average quantity of ice required for cooling 100 lb. of milk in producing Grade A was 107 lb. and Grade B 41 lb., during July and August 1939, these averages being those of the consumption of four producers of each grade. In wet storage a six-times increase in cooling rate was obtained by agitation of the cooling water. In a 4-in. concrete storage tank the power consumption was reduced by 50 percent by the use of suitable insulation. The operating costs of wet storage may be reduced by from 25 to 40 percent by operation at rated capacity. Suitable methods being used, milk of very low bacterial count can be produced by ice cooling. The cost of cooling milk was least in wet storage and most expensive in ice cooling. Power required in cooling milk can be reduced from 18 to 32 percent by running water at 60° through the top half of the tubular surface cooler. Power required to keep the wet storage box cool varied from

20 to 28 percent of the total required at rated capacity of the cooler. Electric mechanical refrigeration was the most satisfactory method for cooling milk.

Farm buildings in land-use planning, W. A. ROWLANDS. (Univ. Wis.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 25-26, fig. 1).—This mainly economic discussion is based on phases of the farm-building problem brought out by county planning committee reports from three Wisconsin counties. The Kenosha County report points out that changes in production methods have resulted in making the average dairy or general farm an awkward unit, too large for one man but too small for two men. The minimum arable acreage should be 70, and if equipment and labor are available, 160 acres is considered a more suitable size. The Barron County report notes increased living, production, and marketing costs, together with higher taxes, without proportionate increases in prices obtainable. There has also been a serious loss of soil fertility, the replacement of which will mean additional and substantial cash outlay. The Marinette County report recommends, as a part of a well-managed northern Wisconsin farm, a selectively managed wood lot to provide all necessary dimension timber and finished lumber, and suggests also the need for portable sawmills and planers of improved accuracy and efficiency. The author points out the functions and responsibilities of the agricultural engineer indicated by the findings of these committees.

AGRICULTURAL ECONOMICS

Papers and proceedings of the fifty-third annual meeting of the American Economic Association (*Amer. Econ. Rev.*, 30 (1941), No. 5, pp. XVI+458, pls. 5, figs. 29).—Included are the following main and review papers with discussion on Agriculture in The American Economy and other economic subjects, presented at the meeting at New Orleans, December 27-30, 1940: An Appraisal of the National Interest in the Agricultural Situation, by H. R. Tolley (pp. 108-126) (U. S. D. A.); Economic Effects of Agricultural Programs, by T. W. Schultz (pp. 127-154) (Iowa Expt. Sta.); The Farmer is Dependent on National Programs, by B. H. Hibbard (pp. 155-164); Measures for the Improvement of Agriculture, by J. D. Black (pp. 165-176); The Price Level and the Gold Problem, by H. P. Neisser (pp. 1-17); The Price Level and the Gold Problem—Retrospect and Prospect, by C. O. Hardy (pp. 18-29); Eight Questions on Gold—A Review, by F. Machlup (pp. 30-37); Comments on Gold and the Monetary System, by W. A. Brown, Jr. (pp. 38-51); Deficit Spending, by J. H. Williams (pp. 52-66); The Federal Budget—Economic Consequences of Deficit Financing, by B. F. Haley (pp. 67-87); Economic Consequences of Deficit Financing—A Review, by D. T. Smith (pp. 88-98); Direct Versus Fiscal and Institutional Factors, by L. H. Seltzer (pp. 99-107); Consumption—A Vast Underdeveloped Economic Frontier, by T. J. Kreps (pp. 177-199); Prices, Costs, and Investment, by R. M. Bissell, Jr. (pp. 200-227); Private Investment, Full Employment, and Public Funds, by O. L. Altman (pp. 228-236); Savings, Investment, and Consumption, by I. de Vegh (pp. 237-247); Unemployment in the United States, 1930-40, by P. Webbink (pp. 248-272); Unemployment—Analysis of Factors, by O. Morgenstern (pp. 273-293); The Economists and Unemployment, by E. W. Bakke (pp. 294-300); An Economic Foreign Policy for America, by P. T. Ellsworth (pp. 301-319); Some Aspects of Our Foreign Economic Policy, by L. Pasvolsky (pp. 320-337); United States in the World Economy, 1940—A Summary, by E. M. Patterson (pp. 338-343); War and Inflation Since 1790 in England, France, Germany, and the United States, by H. Oliver (pp. 344-351); Postwar Depressions, by W. L. Thorp (pp. 352-365); Some Aspects, Near-Term and Long-Term, of the International Position of the

United States, by A. H. Hansen and A. R. Upgren (pp. 366-372) (Univ. Minn. et al.); Some Economic Problems in the Expansion of Capacity to Produce Military Goods, by T. O. Yntema (pp. 373-378); Major Controversies as to the Criteria of Reasonable Public Utility Rates, by J. C. Bonbright (pp. 379-389); and Concentration and Product Characteristics as Factors in Price-Quantity Behavior, by W. L. Thorp and W. F. Crowder (pp. 390-408).

Also included are the remarks of Davis Rich Dewey at the testimonial dinner in his honor, summaries of the papers at Round Table Conferences on Economic Research by P. T. Homan and on Problems in the Teaching of Economics by R. H. Blodgett, and the reports of officers and committees.

[**Proceedings of the thirty-first annual meeting of the American Farm Economic Association**] (*Jour. Farm Econ.*, 23 (1941), No. 1, pp. [4]+398, figs. 18).—Papers, with discussions, presented at the meeting held at New Orleans, La., December 27-29, 1940, are included as follows: Newly Developing International Situation and American Agriculture, by O. B. Jesness (pp. 1-14) (Univ. Minn.); Social Effects of the War and the Defense Program on American Agriculture, by R. C. Smith (pp. 15-27) (U. S. D. A.); American Agriculture in the New War and Defense Situation, by J. D. Black (pp. 28-36); Some Current Problems in Agricultural Credit, by A. G. Black (pp. 37-51) (U. S. D. A.); The Function of Credit in Modern Agriculture, by E. C. Young (pp. 52-70) (Purdue Univ.); Methods of Wage Determination in Agriculture, by M. R. Benedict and R. L. Adams (pp. 71-88) (Univ. Calif.); Changing Structure of Agriculture and Its Impacts on Labor, by J. A. Hopkins (pp. 89-111) (Iowa Expt. Sta.); Future of Cotton in the Economy of the South, by O. C. Stine (pp. 112-137), and The Expanding Scope of Agricultural Economics, by H. G. Porter (pp. 138-144) (both U. S. D. A.); Reconsideration of Rent Theory as It Applies to Agricultural Land, by C. H. Hammar (pp. 145-160) (Univ. Mo.); Institutional Economics in Land Economic Theory, by G. S. Wehrwein (pp. 161-172) (Univ. Wis.); Legal Aspects of Land Tenure, by M. Harris (pp. 173-184) (U. S. D. A.); Effect of Tenure Systems on Agricultural Efficiency, by R. Schickele (pp. 185-207) (Iowa State Col. and U. S. D. A.); Progress of Tenure Groups, by H. Hoffsommer (pp. 208-217) (La. State Univ.); Orientation of Farm-Management Research to Low-Income Farms, by S. E. Johnson and D. R. Rush (pp. 218-245), Objective Sampling in Estimating Southern Crops, by D. A. McCandless (pp. 246-255), and Problems in Estimating Texas Citrus Fruit, by V. C. Childs (pp. 256-265) (all U. S. D. A.); Highlights of the 1940 Census, by Z. R. Pettet (pp. 266-276); Status and Appraisal of Research in Farm Tenancy, by J. Ackerman (pp. 277-290); Needed Research in Farm Tenancy, by M. M. Kelso (pp. 291-310) (U. S. D. A.); Application and Uses of the Graphic Method of Multiple Correlation, by H. R. Wellman (pp. 311-316) (Univ. Calif.); Place of, and Limitations to the Method, by W. C. Waite (pp. 317-323) (Univ. Minn.); Problems of Graduate Students in Rural Social Sciences (pp. 324-328); Quality-Price Differentials in Cotton Marketing, by L. D. Howell (pp. 329-338) (U. S. D. A.); and Seasonal Patterns in Tobacco Prices, by C. M. Clark (pp. 339-361) (Univ. Ky.).

The reports of the officers and committees of the association are included.

[**Papers and notes on rural economics**] (*Jour. Farm Econ.*, 23 (1941), Nos. 2, pp. 399-501, figs. 4; 3, pp. 537-671, figs. 7).—No. 2 includes papers on: Some Neglected Aspects of the Wool Duty, by F. W. Fetter (pp. 399-420); An Investigation on Complementarity Relations Between Fresh Fruits, by S. Hoos (pp. 421-433) (Univ. Calif.); Length of Haul and Farm Commodity Prices, by F. L. Barton (pp. 434-445); Farmers in a Changing World—The 1940 Yearbook of Agriculture, I, by M. G. Reid (pp. 446-450) (Iowa State Col.); II, by D. O.

Hammerberg (pp. 451-453) (Univ. Conn.); and III, by L. J. Norton (pp. 454-455) (Univ. Ill.); Organizational Problems of Agricultural Labor Unions, by H. Schwartz (pp. 456-466); A Neglected Point in the Economics of Soil Conservation, by G. Lange (pp. 467-474); A Neglected Point in the Economics of the Soil—A Reply, by A. C. Bunce and W. W. Wilcox (pp. 475-477) (Iowa State Col.); and Migration and Resettlement in the Far Western States, by D. McEntire (pp. 478-482) (U. S. D. A.). Notes are included on: Some Aspects of the Food Stamp Plan as Applied to Consumption of Fats, by A. Kozlik (pp. 483-492) (Iowa Expt. Sta.); An Experiment on the Accuracy of Farm Survey Data, by J. A. Hopkins (pp. 492-496) (Iowa State Col.); Price-Quality Relations in the Cotton Market of Victoria, Texas, by W. E. Paulson (pp. 496-499) (Tex. A. and M. Col.); and Comments on Sampling to Increase the Usefulness of Farm Management Research, by E. B. Hill (pp. 499-501) (Mich. State Col.).

No. 3 includes papers on: Control in the Sugar-Cane Industry of South Africa, by J. M. Tinley and B. M. Mirkowich (pp. 537-549) (Univ. Calif.); Long-Term Forecasting of Fruit and Nut Production, by M. Clawson, C. P. Heisig, and E. B. Hurd (pp. 550-566) (U. S. D. A.); Margarine Legislation, by W. T. Mickle (pp. 567-583) (Tex. A. and M. Col.); Indexes on a Type-Farm Basis, by W. Malenbaum (pp. 584-606); Sources and Distribution of the Farm Population in Relation to Farm Benefit Payments, by T. L. Smith and R. W. Roberts (pp. 607-618) (La. State Univ.); Export Subsidies and Agricultural Income, by R. S. Nelson (pp. 619-631); and Expectation and Performance—Related to Conservation and Production Adjustments in the Midwest Dairy Region, by R. P. Christensen (pp. 632-645) (U. S. D. A.). Notes included comments by R. E. Moody and reply by A. C. Bunce (Iowa State Col.) to papers by Bunce previously noted (E. S. R., 84, p. 255) (pp. 646-653); reply by A. Kozlik (Iowa Expt. Sta.) to a paper by S. Hoos, noted above (pp. 654-656); Land Classification, Land-Use Areas, and Farm Management Research, by C. A. Boonstra and J. R. Campbell (pp. 657-664) (La. State Univ.); Wheat Yield Insurance, by D. E. McCarty (pp. 664-667); and Correlation Analysis of Farm Land Values, by J. P. George (pp. 668-671).

[Investigations in agricultural economics by the New Hampshire Station, 1940]. (Partly coop. U. S. D. A.). (*New Hampshire Sta. Bul. 330 (1941), pp. 15-18, 18-20*).—Brief general findings not previously noted are included as follows: (1) Number and size of dairy herds and relative opportunities for commercial dairying in four areas of the State, by H. C. Woodworth and J. C. Holmes; (2) number of hours of labor and gallons of spray used per mature trees, based on calyx spray records on 43 farms for 162 orchard years, by Woodworth; (3) preliminary data as to the relation of liabilities to total assets of 100 dairymen in the wholesale milk areas of the State, studied by B. Peterson; (4) general information as to extent and possibility of farm woodlots in Coos County, by J. M. Chandler; and (5) some possible savings to farmers through purchasing feeds, fertilizers, coal, and oil by ordering in large lots, paying in advance, and taking delivery in large quantities, by L. A. Dougherty.

[Investigation of agricultural economics by the North Dakota Station]. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 4 (1941), No. 1, pp. 13-16*).—The findings as to assessed valuation, tax delinquency, county expenditures and indebtedness, cost per pupil in elementary schools, township expenditures, etc., in a study in Burke County, made by M. H. Taylor, are briefly summarized. The usual table by W. L. Ettesvold of average prices received by North Dakota farmers shows the average prices and price relations for 14 products on August 15, 1941, with comparisons with July 1941, August 1940, and the average for 1910-14.

Current Farm Economics, [October 1941] (*Oklahoma Sta., Cur. Farm Econ., 14 (1941), No. 5, pp. 129-160, figs. 4*).—In addition to the usual discussion of the agricultural situation and the index numbers, articles are included on Oklahoma Agricultural Production Goals for 1942, by L. S. Ellis (pp. 135-142); Why Not Buy Just the Surface? by L. A. Parcher (pp. 146-151), which discusses the operation of surface and subsurface ownership of land; and Principles of Agricultural Cooperation, by A. L. Larson (pp. 151-155). Using data for 72 Garfield County farms for 1938 and 47 farms in 1940, analysis is made by P. Nelson and R. Edwards of the fixed and variable costs, income, and net profits for all the farms and the 16 most and 16 least profitable farms each year.

[Articles on agricultural economics pertaining to Wales] (*Welsh Jour. Agr., 16 (1940), pp. 17-98*).—Included are the following: The Labour Requirements of the Ploughing-Up Campaign in Wales, by J. H. Smith (pp. 17-26); Changes in Production of Milk and in Certain Items of Production Costs on Nineteen Farms in Wales for October-March, 1938-9 and 1939-40 (pp. 34-45), and Financial Results on Sixty-Three Farms in Wales (1937-8 and 1938-9) (pp. 45-59), both by J. P. Howell; Agricultural Workers' Budgets, by J. R. E. Phillips (pp. 60-69); Costs of Tractor Work (pp. 70-75); Distribution of Profits by Agricultural Co-Operative Societies in Wales (pp. 76-80), and Some Legal and Political Implications of Government Guarantees for Farmers (pp. 81-91), both by W. H. Jones; and The Cost of Grazing on Welsh Farms, by J. D. Griffiths (pp. 91-98).

[Papers on farm management and appraisal of rural lands] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers, 5 (1941), No. 1, pp. [2]+80, figs. 10*).—Included are the following papers presented before the American Society of Farm Managers and Rural Appraisers at Chicago, December 2-3, 1940: Measuring the Effect of Soil Management Practices upon the Productivity of Farm Land, by J. A. Slipper (pp. 8-14) (Ohio State Univ.); Field Method for the Estimation of Soil Textures, by J. A. Hobbs (pp. 24-31); Problems in Ranch Appraisal, by B. Sifton (pp. 32-37); Possible Effects of Improved Moisture Conservation Practices upon the Productivity and Value of Land, by F. L. Duley (pp. 39-52) (U. S. D. A.); Land Classification as an Appraisal Aid, by A. A. Dowell (pp. 53-58) (Univ. Minn.); and What We Can Learn from Appraisal Studies, by R. H. Cole (pp. 64-70) (U. S. D. A.).

Other papers included are The Function of Credit in Modern Agriculture, by E. C. Young (pp. 15-23) (Purdue Univ.) (see page 400); and The Soil as a Farm Commodity or a Factory, by W. A. Albrecht (pp. 59-63) (Univ. Mo.), presented at the Conservation Conference, Columbia, Mo., June 28, 1940.

The cotton-and-tobacco South (*U. S. Dept. Agr., Misc. Pub. 474 (1941), [pp. 19, figs. 45]*).—This is a popular bulletin describing briefly the soil conservation needs of the 13 cotton-and-tobacco States of the South, and methods for correction of soil erosion.

Farm ownership, tenancy, and land use in a Nebraska community, R. DILLER (*Chicago: Univ. Chicago Press, [1941], pp. VII+192, [figs. 11]*).—This study of the community surrounding Diller, Nebr., was made in 1937. The chapters deal with the natural background; speculators and settlers; the economic background; the development of stable tenure; functional tenancy; and roads, farms, and fields.

The agricultural land market and its control, G. COSTANZO (*Internatl. Rev. Agr. [Roma], 32 (1941), No. 5, pp. 133E-156E*).—The characteristics of the land market, the formation of land prices, the tendencies of the evolution of the land market in the United States, the Netherlands, Belgium, and France, and the government actions for the control of the land market in Germany, Switzerland, the Netherlands, and Italy, are discussed.

Farm taxes and the cost of public services in relation to land resources in Ringgold County, Iowa, J. L. SPAULDING. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 288 (1941), pp. 317-394, figs. 5).—The objectives of this report are: "To measure the burden of taxes on farm property; to analyze the process of assessment and its relation to the unequal incidence of the tax burden; to investigate the possibility of local school reorganization in the interest of relieving the tax burden and to appraise the need for State aid for schools in the area; to point out the need for improved road facilities; to examine the effect of homestead credit as a device for tax relief on farm property; [and] to indicate the implications of local public finance problems for other socioeconomic relationships affected in the readjustment in land use." It is based on a survey of 172 separate ownership tracts in three townships of the county, and most of the data are for the 1938 crop year. The characteristics of the land resources, their utilization, and the cost of public services are described. Analysis is made of the relation of taxes to gross rent, the agricultural conservation payments on rented land, the relief from tax burden through the credit allowed on homesteads, the mortgage indebtedness and interest payments, and the relation of assessments on farm real estate to farm appraisals and agricultural conservation productivity ratings. The road situation—mileage, surface conditions, expenditures, etc., and also the present school situation including the adjustments, reorganization, combination, and State aid needed are discussed.

For the 172 farms studied the average gross rent per acre was \$1.65 and the taxes 82 ct. The averages for the 40 farms in the lowest rent group (\$1 or less per acre) were 64 and 66 ct., respectively, and for the highest rent group (\$2.51 and over) \$2.91 and \$1.09, respectively. Some farms were assessed at twice, and others at only two-thirds, of their equitable value. Overassessment was especially conspicuous on the poorer grades of land where the greatest depreciation in values has taken place. Homestead credit relieved the tax burden to the greatest extent on small farms, where it covered almost one-half to three-fourths of the total tax. The average tax reduction averaged 30 percent on the farms receiving it, but only about 31 percent of the total taxable acreage is aided by homestead credit. It is estimated that the landlord's share of the agricultural conservation payments amounted to about one-fourth of his gross rent, or about one-half of his tax bill. School districts levied 44 percent of the total taxes in 1937. Decline in number of pupils in both rural elementary schools and in the grades in town and consolidated schools has resulted in higher costs per pupil. High school enrollments have been kept up by increasing numbers of rural children attending, but transportation charges per pupil were high. Economical and more widespread transportation awaits improvement in roads. State aid to schools is needed to equalize more nearly the opportunities of children of the different areas and overcome the handicap brought about by wide variations in the productivity of the lands. The present road facilities do not provide regular access to markets. In 1938, more than 60 percent of the total expenditures by the county was for secondary roads, but only 16 percent of the road mileage was surfaced, thus leaving 84 percent impassable by motor cars during intermittent periods of the year. "The legal limits on millage for road purposes should be raised so as not to hinder road development. However, in view of an expected further decline of the already overburdened tax base, effective and speedy improvement of the secondary road system requires a substantial increase in State (and possibly Federal) aid for farm-to-market roads. From the social viewpoint, such aid, if properly administered and allocated, would represent a good investment, as it would directly facilitate necessary land use adjustments and thereby maintain and possibly increase the land's income-yielding capacity and the tax base."

Annuaire international de législation agricole [International yearbook of agricultural legislation] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr.*, 30 (1940), pp. LXXIV+762).—This volume continues the series (E. S. R., 83, p. 552). It includes the text of the more important laws enacted and decrees, orders, etc. promulgated, and references showing the titles, dates, official publications in which published, etc., for those of secondary importance. A chronological list by countries of legislation, etc., in 1939 and 1940, and an alphabetical list by subjects are included. In the introductory section (pp. XVII-LXXXIV), the measures for codification of legislation pertaining to agriculture, for State intervention in the operation and transfer of lands, the amelioration of agricultural conditions, colonization, the creation and protection of small holdings, the consolidation of holdings, agricultural credit and wages, are discussed.

Agricultural labor research: Proceedings of the Conference on Research Relating to Labor in Agriculture, held in Berkeley, California, in March 1940, edited by W. S. HOPKINS (*Stanford University: Social Sci. Res. Council, 1940, pp. VII+67*).—Included are a paper entitled Research Needs in the Field of Agricultural Labor, by J. D. Black (pp. 1-4), and discussions on the following topics: Types of agricultural labor, changes in farm structure which affect agricultural labor, migration of agricultural labor, the law with respect to agricultural labor, welfare and farm labor, and the formulation of research programs.

World wheat survey and outlook, September 1941, H. C. FARNSWORTH and B. M. JENSEN (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 18 (1941), No. 1, pp. [2]+1-36, figs. 6*).—"Heavy British takings of overseas wheat in the last quarter of 1940-41 brought world exports for the crop year to about 490 million bushels. . . . After allowance for sinkings of less than 10 percent, and for some diversions, British imports may have approximated 240 million bushels. Such imports presumably permitted expansion of British year-end wheat reserves to a record level. In contrast, imports into the Axis-dominated area were notably light, and wheat carry-overs throughout that territory were considerably reduced. In the major exporting countries, wheat-surplus problems continue pressing. Old-crop stocks on August 1 were unprecedentedly large in Canada, in North America, and in the four chief exporting countries combined. . . . Prices have changed little since May, except in the United States; here a rise of 30 ct. mainly reflected transition from a basic loan rate of 64 ct. last year to 98 ct. in 1941-42. Unless large wheat shipments are sent to relieve distress in Russia or elsewhere, world exports seem likely to be smaller under continued war this year than in 1940-41—perhaps no more than 400 to 450 million bushels. Much will depend on Britain's import policy and the international status of Spain. Bread-grain supplies within the Axis area appear to be about the same size this year as last. Unless German-sponsored imports are obtained, serious shortages may develop in Greece, Belgium, and Norway, and possibly in the Netherlands, Finland, and Poland."

An economic study of truck farming in Copiah County, Mississippi, 1938-1940, M. GUIN and D. W. PARVIN (*Mississippi Sta. Bul. 361 (1941), pp. 35, figs. 11*).—Survey records on 80 farms were obtained. Analysis was made of the land use investments, acreage of principal crops, receipts, expenses, value of farm privileges, profits, and the factors affecting profits. Commodity studies were made for cabbage, tomatoes, peas, beans, and cotton. Brief statements are included as to the use of long- and short-term credit and accounting.

The average farm included 131 acres with 55 acres in crops. The average investment for the 3 yr. ranged from \$4,198 to \$4,950. Of the average cropped acreage, 22.5 acres were in corn, 7.3 in cotton, and 21.2 in truck crops (from 16 to 20 acres were double-cropped). The labor income per farm was \$50 in 1938,

\$54 in 1939, and —\$55 in 1940. That for a majority of the farms ranged from —\$250 to \$250. Marketing efficiency and production efficiency were the most important factors causing variations in incomes. Size and balance of business had no constant effects. The profitability of individual truck crops varied greatly from year to year, and a different crop was most profitable in each year studied.

The average returns per acre, to labor per acre, and per day of labor were: Cotton \$5.26, \$17.61, and \$1.43; cabbage \$2.16, \$13.62, and \$1.18; peas —\$4.84, \$8.01, and 66 ct.; beans —\$6.60, \$3.53, and 35 ct.; and tomatoes —\$14.26, \$4.92, and 26 ct.

Costs and returns for the cabbage enterprise, 1938 and 1939, R. W. HOECKER (*New York*] *Cornell Sta. Bul.* 759 (1941), pp. 60, figs. 6).—Records of costs of producing and marketing cabbage and the labor incomes were obtained for 100 Onondaga County farms for the crop year 1938, and 70 for the year 1939. Sixty-two of the farms grew cabbage both years. Analysis is made of the growing, harvesting, and marketing costs, returns and gains or losses, and also of the factors affecting costs and returns. The marketing of the crop—use of crop, sales and prices by months, place of delivery and type of transportation, and type of buyer and package are discussed.

The average acreage of cabbage per farm and the average yield per acre in 1938 were 7.1 acres and 14.76 tons, and 5.9 acres and 7.04 tons in 1939. The average total costs in 1938 were \$89.47 per acre or \$6.59 per ton, and in 1939 \$70.91 per acre or \$10.19 per ton. The total returns were \$61.64 per acre or \$4.54 per ton in 1938, and \$96.62 per acre or \$13.89 per ton in 1939. Important factors affecting yields are climate, crop rotation, quality of seed, amount of fertilizer used, and date of setting. In 1938, the group of farms with less than 4.5 acres of cabbage had a loss of \$2.43 per ton, those with 4.5–7.9 acres a loss of \$1.27 per ton, and those with 8 acres or more a loss of \$1.99 per ton. In 1939, growers with less than 5 acres had a gain of \$2.28 per ton, and those with 5 acres or more a gain of \$4.06 per ton. Type of cabbage grown made little difference in returns for labor in either year.

Farm organization and costs and returns in producing potatoes on farms in the St. John River Area of Aroostook County, Maine, 1937, W. E. SCHRUMPF (*Maine Sta. Bul.* 406 (1941), pp. [4]+82, figs. 19).—Information as to the farm business, and especially the potato enterprise, was obtained on 241 farms by the survey method. Analysis is made of the amounts, distribution, and variations in capital; receipts, expenses, and income for the farms; the costs of producing, harvesting, storing, and selling potatoes; the returns from potatoes; and the effects of different farm-business efficiency features on costs and income.

The average size of farms was 165 acres, of which 79 were in crops, 18 being in potatoes, 25 in grain, 29 in hay, and 7 in green manure crops, beans, peas, green feed, turnips, etc. The average net income including farm products used in the home, including an allowance for house rent, was \$170, the farm income —\$779, the labor income —\$1,196, the labor earnings —\$646, and the family labor earnings —\$247. The return on capital averaged —\$1,543 per farm. Using the average price of potatoes for the 10 yr. prior to 1937, the farm income would have been \$364, the labor income —\$53, labor earnings \$497, and the family labor income \$896. The average cost for potatoes per acre and per barrel was: Growing, \$78 and 68 ct.; harvesting, \$13 and 12 ct.; storing, \$17 and 15.3 ct.; and selling, \$4.48 and 4 ct. (per barrel harvested and 5 ct. per barrel sold). The gross returns were nearly \$78 per acre, \$67 being for potatoes sold and \$11 for potatoes used on the farms. The net loss was

nearly \$35 per acre or 31 ct. per barrel harvested. With the 1927-36 average price, there would have been a gain of \$29 per acre. The 1937 labor income decreased, but labor income adjusted to the 10-yr. average price of potatoes increased as size of farm business increased. An increase of 41 bbl. per acre in potato yield increased the adjusted labor income \$215 and decreased the cost of production 22 ct. per barrel on farms having less than the average size of business, and increased the income \$1,244 and decreased the cost per barrel 24 ct. on the farms above the average. An increase of 667 bbl. per man increased labor income \$567. An increase of 890 bbl. per man increased the labor income \$1,305. A decrease of 6.9 yr. in the time required for farm receipts to equal farm capital was associated with an increase of \$458 in the labor income and a decrease of 8.6 yr. with an increase of \$1,592 in the labor income. An increase of 32.7 points in the percentage of total receipts from potatoes increased the labor income \$48 on small farms. On large farms an increase of 21.1 points was associated with a \$463 increase in the labor income. The farms above the average in size of business, yield rate of potatoes, labor and capital efficiency, and farm balance, as compared with all farms, had 15 more acres of potatoes, 155 more productive-man-work units, 28 more crop acres, 0.5 more productive-animal units, a 23-bbl. higher yield of potatoes per acre, a productive index 15 points higher, 763 bbl. more potatoes produced per man, 23 more productive-man-work units per man, 3 more acres of crops per man, and required 3.5 less years for the farm receipts to equal farm capital.

Handling and marketing Iowa sweet potatoes, A. T. ERWIN, G. SHEPHERD, and P. A. MINGES (*Iowa Sta. Bul. P32, n. ser. (1941), pp. 73-103, figs. 5*).—The production of sweetpotatoes in Iowa; the influence of competing areas, seasonal price variations, transportation, prices in Iowa and competing areas, geographical distribution of Iowa shipments and consumption on marketing Iowa sweetpotatoes; handling and marketing—bulk marketing containers, consumer packages, and overweighting baskets; grading; use of culls; branding shipments; storage problems including effects of fertilizers on storage quality and of storage on flavor, and sanitation; factors affecting marketability—rainfall, temperature, time of harvest, and effect of fertilizers on sugar content and shape of roots; and varieties including comparison of yields and consumer preferences are discussed.

The study showed that the most marked advance in prices usually occurs during November and December, and then prices remain fairly constant during the remainder of the marketing season; temporary storage until about December permits growers to realize on the price advances and to avoid the hazards of shipment in severe winter weather; price advances after December are not sufficient to warrant storage for the late winter market; and returns can be improved by temporary storage, grading, branding, advertising, improvement in packaging, and use of culls for stock feed.

Cotton marketing in South Carolina, W. T. FERRIER and H. A. WHITE (*South Carolina Sta. Bul. 335 (1941), pp. 28, figs. 4*).—This study deals with the marketing of the 1939-40 crop. It analyzes and discusses the price-quality relationships, the losses resulting from gin damage, the price variations due to transportation costs and to quality, and the production and the demand and supply situation in the State. Data were obtained from the U. S. D. A. Agricultural Marketing Service on grade and staple of cotton ginned in the State and the number of bales receiving a lower grade due to poor ginning preparation for 45 gins in representative areas. Price data were obtained by tracing individual bales through the books of the ginners and buyers in four markets selected as fairly

representative of different producing areas and of the more important types of primary markets. Price relationships were computed on the basis of premiums and discounts and the spot price existing in the Augusta, Ga., market on the day on which each bale was sold. A method for identifying growers of high or low quality cotton is outlined.

The study corroborated findings in other studies of the South Carolina and other State experiment stations and of the U. S. Department of Agriculture that prices paid in local markets are usually average or "round-lot" prices and do not reflect differences in quality of individual bales; that differences of quality as between growers are frequently not recognized; and that growers of poor quality cotton are often overpaid while growers of high quality cotton are underpaid. Differences ranging up to \$5 per bale were paid in the same market on the same day for cotton identical in class. Variations in price were more often for differences in staple than for differences in grade. Of 2,006 bales from 328 gin patrons in two communities, 246 bales were short cotton ($3\frac{1}{32}$ in. or shorter). While 31 percent of the patrons grew some short cotton, only 9.5 percent grew three bales or more of such cotton, but these producers produced 56.1 percent of all the short cotton.

Losses from gin damage averaged \$3.49-\$4.42 per bale of the cotton so damaged in the four markets studied. Due to proximity to mills, South Carolina growers received 50-75 points above the central market prices and 120 points over Oklahoma and Texas local market prices. "When both grade and staple are considered, the 1939 South Carolina crop was worth bale for bale practically the same as Texas or Oklahoma cotton. Premiums which South Carolina cotton earned for its longer staple were offset by discounts due to its lower grade." During the period 1928-40, the harvested acreage of cotton in the State decreased 47.8 percent, but due to increasing yields the total production was fairly uniform throughout the period. The proportion of staple of $\frac{7}{8}$ in. or less dropped from more than 60 percent to less than 5 percent, and that of 1 in. or longer increased from less than 20 percent to over 72 percent. Consumption in the State of all staples collectively exceeds production by more than 50 percent, but production of $\frac{15}{16}$ - and $3\frac{1}{32}$ -in. staples was slightly greater than the consumption. Because of requirements as to quality, the consumption in the State is hardly one-third of the production.

Economic trends in livestock marketing, S. H. THOMPSON (*St. Louis, Mo.: John S. Swift Co.*, [1940], pp. 2+VII+174, figs. 31).—The material is presented in chapters on the problem, recent changes in livestock marketing, increase of livestock income by effective marketing, developing effective organization for cooperative livestock marketing, and summary and conclusions. It applies particularly to Iowa, and special emphasis is placed on cooperative livestock marketing. A selected bibliography is included.

The farm price of tobacco in Puerto Rico from 1907 to 1940, J. J. SERRALLÉS, JR., and M. VELEZ, JR. (*Puerto Rico Univ. Sta. Bul.* 60 (1941), pp. [2]+38, figs. 13).—A translation by C. E. Gage of the Spanish edition previously noted (*E. S. R.*, 86, p. 116).

The frozen food industry, H. CARLTON (*Knoxville: Univ. Tenn. Press*, 1941, pp. [8]+187, figs. 38).—Included is the more important information contained in Tennessee Experiment Station Bulletin 173 (*E. S. R.*, 85, p. 551).

The demand for milk and cream as revealed by consumer purchases at retail food stores in New York City, C. J. BLANFORD. (*Coop. U. S. D. A.*). (*[New York] Cornell Sta. Bul.* 765 (1941), pp. 47, figs. 10).—Since retail food stores in New York City distributed more than half the milk purchased for home consumption, a survey was made of the daily sales in June 1938, June 1939,

and April 1940 in approximately one-fourth of these 18,000 stores distributed in low-, medium-, and high-income areas. Information was also obtained as to the demand for paper containers and for delivery service on the part of the families who purchased their milk principally at stores.

Daily sales, chiefly of Grade B milk, amounted to 83, 95, and 79 qt. per store in the 1938, 1939, and 1940 surveys, respectively, while the corresponding cream sales approximated 15, 16, and 13 half pints daily. These sales were made at times when Grade B milk delivered to the doorstep was priced at 12½ and 11½ ct., while over-the-counter prices ranged from these quotations down to as low as 4 ct. a quart. Total milk purchases (store and retail route sales) per capita were greater in those areas of Manhattan and the Bronx where the proportion of milk sold through stores was greatest. Milk in paper containers, costing at least 1 ct. more a quart than that in bottles, was purchased in small amounts in low-income areas, but in high-income areas the per capita purchase of milk in the two types of containers was about the same. In low-income areas per capita purchases of fresh milk at stores were largest and of evaporated milk smallest in areas where there was least spread between the prices of fresh and evaporated milk. In general a 3-percent change in price resulted in a 1-percent change in purchases of milk by families in low-income areas, although there was no appreciable effect on purchases by families in high-income areas.

Under price and employment conditions at the time of this study it appeared that most low-income families in New York City used a minimum of about 0.4 pt. of milk per capita daily, but that their purchases increased considerably when the price fell below 10 ct. a quart. The low-income families spent about 40 percent less for milk than families in high-income areas. This difference resulted from purchase by the former group of the more economical milks (Grade B, unadvertised brands, in glass bottles, and over the counter) and by the purchase of about one-fourth less milk than was bought by the high-income families. Even including the milk equivalent of the additional evaporated milk, the milk purchases of the low-income families were about 20 percent less per capita than in the case of the families in high-income areas.

Consumer buying of potatoes and store offerings, A. S. HOTCHKISS ([*New York*] *Cornell Sta. Bul.* 764 (1941), pp. 34, figs. 10).—This report deals with one part of an investigation of consumer practices in buying potatoes as related to retail-market offerings in Cleveland, Ohio, and Rochester, N. Y., in 1936-39 (E. S. R., 85, p. 269). It presents the findings obtained (1) in visits to retail stores where 4,957 consumer purchases of potatoes were observed, and records were kept of the kind and quantity bought by each purchaser, the price paid, and the method of buying, and (2) in home interviews with 3,143 consumers observed buying potatoes who were questioned concerning the potato consumption and preferences of their families. Fifteen-lb. samples of 1,078 lots of potatoes from which the consumers purchased were shipped to New York State College of Agriculture where they were graded by the Department of Vegetable Crops and prepared, cooked, and graded for cooking quality by the College of Home Economics.

The study showed that consumers did not shop around for their potatoes, but generally bought them with little or no inspection at the same store where they bought other foods. Dissatisfaction with potatoes bought was apparently lacking even though many of the potatoes were of poor quality. Little relation was found between the retail price of the potatoes and the grade. The family income, the type or varieties of potatoes offered by a retailer, and the relative differences in the prices of the varieties offered determined the kinds of potatoes bought. Since the available supply of potatoes varied considerably, it is thought that consumers may best rely on their retailers to supply them with as good

quality of potatoes as possible at prices consumers are willing to pay. During the period covered by the study, the amount of potatoes, both Rural and Green Mountain, appearing in the retail market in branded consumer packages increased. Because of the higher price and the larger unit of sale (10 lb.), their use was limited to families with higher incomes. Consumers did not like potatoes too large or too small, but apparently did not care to have them uniformly sized. External conditions of the potato caused no great amount of dissatisfaction, since the majority of potatoes were peeled and boiled.

RURAL SOCIOLOGY

The challenge to democracy, IV, V (*Iowa Sta. Buls. P24, n. ser. (1941), pp. 669-684; P25, n. ser. (1941), pp. 685-700*).—Continuing this series (E. S. R., 86, p. 264), Paper IV, by V. A. Moody, deals with The Test of Citizenship. "Whatever the formal and technical advantages sometimes ascribed to an autocratic government, a democracy through proper action on the part of its people may achieve some measure of success in the same fields and retain its superior advantage in others. It may tend to develop a unity of will; to simplify its structure; to speed up its decisions and to fix authority more definitely. Even continuity of personnel and policy might be more largely emphasized without destroying the principles of democracy. Further, our government can be improved to the best of our ability to make it better suited to the exacting requirements of our complicated industrial civilization."

In Part V, Democracy and Nationalism, by C. H. Matterson, nationalism is explained in conjunction with democracy.

The Iowa farmer and World War II (*Iowa Sta. Bul. P31, n. ser. (1941), pp. 49-70, figs. 8*).—The reports of members of a committee appointed largely from the staff of the Iowa State College are summarized as an interpretation of the development in the war and the defense situation up to March 1941. Changes in farm population, vocational training, farm labor, nutrition and health, cost of living, housing conditions, electricity on the farm, family self-sufficiency, demand for farm products, prices, farm income and its distribution, farm costs, taxes, mechanization of farming, and changes in land use are discussed.

Population aspects of our disorganized national economy, W. H. METZLER. (Univ. Ark.). (*Southwest. Social Sci. Quart., 22 (1941), No. 2, pp. 150-160*).—The author presented evidence of a new era of social and economic relationships in the western world.

Economic impacts of population problems, G. H. AULL. (Clemson Agr. Col.). (*Assoc. South. Agr. Workers Proc., 42 (1941), pp. 60-61*).—The leader concludes that at present, war, disease, plague, vice, death (the "positive checks") and late marriage, sexual denial, and birth control (the "negative checks") are less effective aids to economic and social adjustment than reciprocal trade agreements, old age assistance, mothers' pensions, the ever-normal granary, steeply graduated income and inheritance taxes, land use planning, hot lunches, the WPA, the FSA, and other currently approved devices.

The past decade in southern population, M. D. OYLER and H. W. BEERS. (Univ. Ky.). (*Assoc. South. Agr. Workers Proc., 42 (1941), pp. 59-60*).—The population of the Nation grew by only 7.2 percent between 1930 and 1940, the smallest increase ever to occur and less than half the 16.1 percent of the previous decade. The rural urban ratio is approximately the same (56.5 percent urban). Suburban areas grew nearly three times as fast as their adjacent cities and rural areas. Throughout the Nation a decline in family size was occurring, but more slowly in the Southern States than elsewhere.

Preliminary population analysis, North Dakota, 1930-1940, C. TAEUBER and R. ASHBY. (U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 8-11).—"The impact of the decade 1930-40 with its physical and financial environment stimulated the movement of North Dakota people. The State as a whole lost about 6 percent of its population. Cities of from 2,500 to 10,000 and over all gained about 16 percent. The total farm population declined about 17.5 percent. These shifts in population mean that our cities will have to tax themselves to provide additional public services proportional at least to the increase in population. These shifts also mean a profound change in the distribution and density of the rural population. These shifts are continuing. The impact of defense preparations is accelerating the rate of migration of young men and women out of the State, a migration which, it is to be hoped, will be temporary in most cases. The impact of the 10-yr. trend as revealed by the census and the post-census shifts upon the supply of farm labor, upon the trend toward increased mechanization, and upon the trend to still larger operating units is obvious."

Landless farm people in the United States, M. HARRIS. (U. S. D. A.). (*Rural Sociol.*, 6 (1941), No. 2, pp. 107-116).—"Landlessness is a matter of degree. On one extreme, at the top of the agricultural ladder is the full-owner operator with an adequate size farm unit; and at the other extreme is the unemployed agricultural worker who has no permanent home. Between these two extremes are: Wage workers, migratory and resident; unpaid family workers; hired managers; sharecroppers; full tenants; part-owners; and full-owners. Farmers who have mortgages or who have small units or poor land may to such extent be considered partially landless. According to this concept, estimates are made of the extent of landlessness in the United States as of 1940."

The ecological position of the Japanese farmers in the State of Washington, J. A. RADEMAKER (*Wash. Univ. [Seattle] Pubs., Theses Ser.*, 5 (1941), pp. 331-336).—"To a marked extent, the ecological position of the Japanese farmers in Washington has been defined by cultural conditions and restrictions upon landholding. The stress placed upon the desirability of landownership and citizenship by the cultures of the white immigrant populations was nullified with respect to the Japanese farmers by ethnocentric limitations upon naturalization. These ethnocentric limitations were made the basis of legal restrictions upon all landholding by Japanese farmers when it was seen that the latter were succeeding in their attempt to secure an advantageous ecological position in competition with whites. The constitutional prohibition against landownership by aliens who have not declared their intention to become citizens was expanded in the Anti-Alien Land Acts of 1921 and 1923 into prohibition against the holding of any sort of interest in land by such nondeclarant aliens."

The statutes governing citizenship confer that privilege and responsibility upon only those Japanese who were born in the United States and its territories. As a result, the Land Acts increased the comparative legal powers of American-born Japanese while they decreased those of the foreign-born Japanese. The net result has been a marked change in tenure of farm land by Japanese farmers. Ownership and managership of farm lands by Japanese increased greatly from 1920 to 1930, while tenancy showed a corresponding decrease.

During the pioneer period of settlement, the Japanese immigrants in Washington found their best opportunities in clearing land, building railroads, and logging, in rural areas, and in domestic and personal service in the cities. With the passing of the pioneer "laborer" stage of participation, however, the nationality type of organization tended to break down, and Japanese tried out every conceivable type of occupation.

Japanese holdings have always been highly concentrated in a few limited localities. In the Puget Sound Region they have been recorded only on alluvial

valley-bottom lands, especially of the Puyallup-White River Valley; on upland, sunny slopes of fertile soil, such as abound on Bainbridge and Vashon islands; and on muck and peat soils found in pockets along the edges of lake and Sound water and in swampy inland vales. Soil is an important factor in determining the distribution of Japanese farmers, the latter being found on only 6 of the 26 soils of the region.

White settlement in the Tropics, W. BALLY (*Internatl. Rev. Agr. [Roma]*, 22 (1941), No. 7-8, pp. 205E-246E).—From a study of numerous white settlements having very little in common, it is concluded that, contrary to general opinion, the peasant settler of the white race, whether Mediterranean or Nordic, becomes adapted to the tropical climate; he can not only live in the Tropics but also maintain his family.

The aim and scope of land-use planning, C. H. HAMILTON. (Univ. N. C.). (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 61-62).—The author states that the county land use planning program represents a joint effort by representative farmers in each county, community, and State, the agencies of the U. S. Department of Agriculture, the land-grant colleges, and related State and local agencies.

Some aspects of village demography, T. L. SMITH. (La. State Univ.). (*Social Forces*, 20 (1941), No. 1, pp. 15-25, figs. 3).—The author presents some of the distinguishing features of village population, including age, sex, and marital status. Some of the more important conclusions are:

"The age pattern of the village population is characterized by a slight deficiency of children, a marked deficiency of persons of early working ages, and a very large excess of aged persons. This marked concentration of aged persons in the village is probably its most important population characteristic. The village population is composed more largely of females than is the rural-farm, the rural-nonfarm, or even the urban population of the United States. This difference is more pronounced if the comparison is based on persons 21 yr. of age or over. By far the most striking feature of marital condition in the village is the concentration there, or at least in the small towns, of very large numbers of widowed and divorced females, probably from the surrounding farms."

The analysis further indicates the fallacy of considering village and rural-nonfarm as synonymous categories, and raises grave questions concerning a newer generalization which holds that "village population characteristics are intermediate between those of the city and those of the farms. Instead, the village seems to have its own distinctive population features, some of which set the village apart sharply from all other subdivisions of the population."

Methods of measuring level of living, social participation, and adjustment of Ohio farm people, H. R. COTTAM (*Ohio State Univ., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 139 (1941), pp. [1]+27).—This is a methodological supplement to the above bulletin. It gives a fairly detailed statement of the methods used in analyzing the standards of living of 299 Ohio farm families, and presents simplified and standardized scales for measuring levels of living and social participation.

Income levels of contract beet workers in Nebraska, F. MILLER (*Nebraska Sta. Bul.* 335 (1941), pp. 23, figs. 3).—Income of 135 families from whom information was obtained ranged from \$693.06 to \$2,986.71 and averaged \$1,296.08. Thirteen, or 9.6 percent of the families interviewed, had incomes between \$693 and \$800, and 28 percent received incomes in excess of \$1,500.

"Growers for whom 77.8 percent of the families tended beets, provided living quarters during two or more months of the year. Of the houses provided, 56.2 percent had 3 or more rooms; 25.7 percent had 4 or 5 rooms. One-room labor

houses were occupied 48.3 percent of the year; 4- and 5-room houses were used 75 percent or more of the time. Fifty of the 135 families interviewed owned homes. The purchase price of the houses owned varied from \$75 to \$3,600 and averaged \$981.10. Thirty-eight of the owned homes were clear of debt."

Level of living, social participation, and adjustment of Ohio farm people, A. R. MANGUS and H. R. COTTAM (*Ohio Sta. Bul. 624 (1941), pp. [1]+58, figs. 3*).—Information concerning the ways of living of Ohio farm people is presented on the basis of interviews made in 299 farm homes during the winter of 1939-40. The authors found that Ohio farm people are generally well satisfied with their ways of living. They differ widely with respect to their levels of living, and those ranking high in the scale of living are much better adjusted than those ranking low. The majority of farm people participate little in organized groups, but those who do are better adjusted than those who do not.

Farmers in the farm bureau, W. A. ANDERSON (*[New York] Cornell Sta. Mimeog. Bul. 4 (1941), pp. [2]+41*).—The author presents some of the characteristics of about 1,200 farmers in and outside the farm bureau in Cortland and Otsego Counties, including memberships, social participation, age, farm experience, stability, schooling, family composition, educational and communication facilities, tenure and size of farm, land class, and income.

Farm women in the home bureau, W. A. ANDERSON (*[New York] Cornell Sta. Mimeog. Bul. 3 (1941), pp. [1]+41*).—This study of about 800 families in Cortland County indicates the extent to which farm women participate in the home bureau in New York State, and compares them with farm women who do not so participate in order to discover the distinguishing characteristics of the two groups.

The community situation as it affects agricultural extension work, C. R. HOFFER and D. L. GIBSON (*Michigan Sta. Spec. Bul. 312 (1941), pp. 35, figs. 6*).—"It is plainly evident from the analysis and comparison of the four communities [studied] that no single factor or circumstance in a community situation determines the responsiveness of farmers to agricultural extension programs. Responsiveness is determined rather by a network of social influences and circumstances among which leadership, organization, and group morale among farmers are very important. These are affected, in turn, by economic conditions and community organization. To consider any single item as the sole cause of success or failure of extension work over-simplifies the problem."

Rural relief in Illinois: A study of home assistance in thirteen counties, D. E. LINDSTROM and I. D. JOHNS (*Illinois Sta. Bul. 480 (1941), pp. 393-440, figs. 8*).—From a study of conditions in 13 counties from January 1934 through June 1937, the conclusion was reached that "much of the public aid fell short of being effective enough to put the dependent back on the road to self-support or to provide adequate living standards for those unable to work. . . . Rural families on relief are at a disadvantage because they have had fewer years of schooling and have a greater incidence of ill health than either urban relief families or rural families not on relief. Most of the rural relief clients are unskilled laborers in small towns and villages or farm hands or tenants on poor land. . . . Administration of relief in rural areas must be so coordinated as to prevent unnecessary duplication, assure the efficiency required to help employable dependents become self-supporting, and provide all unemployables on relief with a decent standard of living."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Motion pictures of the United States Department of Agriculture, 1941 (*U. S. Dept. Agr., Misc. Pub. 451 (1941), pp. [2]+29*).—The motion pictures

available are listed and described. How they are distributed and may be purchased are explained. The State institutions lending the pictures are listed.

FOODS—HUMAN NUTRITION

Annual review of biochemistry, X, edited by J. M. LUCK and J. H. C. SMITH (*Stanford University, Calif.: Ann. Rev., Inc., 1941, vol. 10, pp. XI+692*).—Among the 24 reviews comprising this volume, the following deal with topics of nutritional significance: Biological Oxidations and Reductions, by E. S. G. Barron (pp. 1–30); Proteolytic Enzymes, by M. Bergmann and J. S. Fruton (pp. 31–46); Nonproteolytic Enzymes, by H. Tauber (pp. 47–64); The Chemistry and Metabolism of the Compounds of Sulfur, by A. White (pp. 125–150); Carbohydrate Metabolism, by C. F. and G. T. Cori (pp. 151–180); Fat Metabolism, by H. C. Eckstein (pp. 181–196); The Metabolism of Proteins and Amino Acids, by R. Schoenheimer and S. Ratner (pp. 197–220); The Biochemistry of Creatine and Creatinine, by H. H. Beard (pp. 245–264) (La. State Univ.); Detoxication Mechanisms, by J. A. Stekol (pp. 265–284); Hormones, by E. C. Kendall (pp. 285–336); The Water-Soluble Vitamins, by A. F. Morgan (pp. 337–394) (Univ. Calif.); Fat-Soluble Vitamins, by H. A. Mattill (pp. 395–422); and Nutrition, by H. K. Stiebelling and R. M. Leverton (pp. 423–448) (U. S. D. A.).

An inexpensive portable photoelectric colorimeter, R. H. MORGAN and S. WEINHOUSE (*Amer. Jour. Clin. Pathol., 10 (1940), No. 9, Tech. Sup., pp. 114–122, figs. 5*).—The colorimeter described utilizes a photoelectric cell or phototube as the optoelectric device. Its current response to incident light, projected from a small flashlight bulb through the solution whose concentration is to be measured and passed through a selective filter, is small. The cell is used, however, with a vacuum tube amplifier which greatly increases the response so that relatively insensitive and inexpensive current measuring equipment (a milliammeter) may be used. Complete details for construction, operation, and calibration of the instrument are given. A brief bibliography includes references to several treatises that discuss the theory of photoelectric colorimetry and of photoelectric colorimeter design.

Improvements in the photometer and its accessories, A. S. GIORDANO, M. N. STATES, and C. SHEARD (*Amer. Jour. Clin. Pathol., 10 (1940), No. 9, Tech. Sup., pp. 122–129, figs. 6*).—Recent modifications in the instrument and various accessories now available are noted. These include a microattachment with a new photocell having greater current response than older types of cells for a given intensity of light; microabsorption cells of several types; a fixed diaphragm for use with the microattachment to confine the beam of light to a cross section substantially rectangular in shape; and a microadjuster devised for accurate setting of the needle of the meter at the standard 100 division point.

The wheat kernel and its nutritional properties, C. H. BAILEY. (Minn. Expt. Sta.) (*Amer. Miller, 69 (1941), No. 1, pp. 93–94, 137–138, 160, figs. 3*).—This address is concerned with the dietary contribution in protein, minerals, and vitamins of the various parts of the wheat kernel—pericarp, germ, and endosperm—and the relationship between the percentage of flour extraction and the content of these dietary factors in the flour. This composition of wheat and flour is considered in the light of the present "enrichment" program.

Trace metals and total nutrients in human and cattle foods, E. B. HOLLAND and W. S. RITCHIE (*Massachusetts Sta. Bul. 379 (1941), pp. 31*).—Moisture, protein, fat, nitrogen-free extract, fiber, ash (soluble and insoluble), and Fe, Cu, Mn, Zn, Ca, and P were determined by methods noted on a large number of products designated by common and botanical names. Analytical methods

for the mineral determinations are given in detail. The products included 17 fruits classified as major or large fruits (10) and minor fruits and berries (7); 36 vegetables, including 8 garden fruits (tomatoes, eggplant, etc.), 5 legumes (string beans, peas, and shell beans), and 23 leafy and stem vegetables; 12 cereals; 4 nuts; 8 processed human foods (chiefly cereal products); 25 cattle feeds, including 11 hays and grasses and 14 feeds used as protein sources; 10 samples classified as kitchen wastes (chiefly skins and tops); and 8 miscellaneous products. Data are reported for more than 1 sample of many of the products, with brief descriptive notations indicating varietal, cultural, or other differences between samples.

Conserving minerals and vitamins in vegetables, O. SHEETS (*Mississippi Sta. Bul.* 362 (1941), pp. 15, figs. 4; also in *Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 9, pp. 3-5, 8, figs. 4).—This study, concerned with the losses of minerals and vitamins occurring with different methods of preparing, cooking, and preserving vegetables, summarizes findings from various studies, including several noted earlier from this station (E. S. R., 82, pp. 415, 846; 85, p. 556).

The home canning of fishery products, N. D. JARVIS and J. F. PUNCOCHAR (*U. S. Dept. Int., Bur. Fisheries, Invest. Rpt.*, 2 (1940), No. 34, rev., pp. II+36, figs. 6).—This revision of a publication noted earlier (E. S. R., 77, p. 563) considers the general principles involved in canning sea foods, the equipment needed, and the general canning procedure, and presents simple, practical, and safe methods now developed for canning the most important varieties of fish suitable for canning, as well as a number of fishery products.

Community food preservation centers, B. FURMAN ET AL. (*U. S. Dept. Agr., Misc. Pub.* 472 (1941), pp. III+64, figs. 5).—This handbook, combining research results with practical experience, is offered as a contribution to community food preservation programs for defense. Based on subject matter furnished by the Bureau of Home Economics, the Extension Service (Federal and State), the Farm Security Administration, and the Works Projects Administration, the publication represents a revision and an enlargement of an earlier booklet on community canning centers (E. S. R., 70, p. 892).

Making the nutrition program work, C. M. LADD. (Cornell Univ.). (*Family Dollar*, 2 (1941), No. 7, pp. 12-15, figs. 3).—An address delivered at the New York State Nutrition Conference, July 1941.

Nutritional studies of foodstuffs used in the Puerto Rican dietary.—VII, A comparative study of the nutritive value of three diets of frequent use in Puerto Rico, D. H. COOK, J. H. AXTMAYER, and L. M. DALMAU (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 16 (1940), No. 1, Eng. text, pp. 3-13; Span. text, pp. 14-25).—Three typical diets were selected for study, these being (1) the continental diet as used by natives of the United States long resident in Puerto Rico, (2) the caterer diet as used by a large group of families who buy their food already prepared from caterers, and (3) the country family diet representative of that consumed by the poorest country families. Diets of this latter type were prepared in the laboratory from food lists obtained in a study by the insular department of education as to the kinds and weights of foods consumed by a family for a week. Aliquot weights or volumes of these various dishes and foods prepared in the laboratory and of continental and caterer diets as prepared for family consumption were composited daily for each of the three diets over periods of several weeks. These diets were analyzed for proximate constituents and calcium, phosphorus, and iron, using A. O. A. C. methods, and assayed for vitamin A, using the method of Sherman and Munsell. The results, reported as percentage values (and as units of vitamin A per gram) are also calculated to a uniform daily basis of grams (and units) per 2,400 calorie portions.

On the latter basis, the average daily consumption of nutrients in the continental, caterer, and country family diets, respectively, is as follows: Protein 55, 86, and 59 gm.; fat 99, 76, and 62; carbohydrates 321, 340, and 400; calcium 0.352, 0.277, and 0.291; phosphorus 1.29, 1.49, and 0.734; iron 0.021, 0.028, and 0.032 gm.; and vitamin A 7,895, 2,419, and 1,220 Sherman units. These data, considered from the standpoint of nutritional standards of adequacy, indicate that the protein content was quantitatively adequate in all dietaries, but of poor quality in the two native diets. Calcium was low in all dietaries, and vitamin A did not meet the level for adequacy in either of the native diets. A high proportion of rice and beans, lack of milk and dairy products, and a small quantity of vegetables characterized the native diets.

The nutritive value of the proteins of rice and its by-products.—III, **Amino acid content**, M. C. KIK. (Ark. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 3, pp. 349-354).—In continuation of this study (E. S. R., 84, p. 550), whole rice, polished rice, rice bran, and rice polishings were analyzed, by methods noted briefly, for their content of cystine, tryptophan, lysine, arginine, and histidine. Whole rice and polished rice were not lacking in cystine or lysine, but the levels were low as compared to casein and wheat. The results confirmed earlier findings as to the supplementary effect of cystine and of lysine in promoting rat growth on rations in which protein was furnished by whole or polished rice. Tryptophan, arginine, and histidine contents compared favorably with the amounts of these amino acids in wheat and corn. Rice bran and rice polishings were appreciably richer in the several amino acids than were the whole and polished grain. The six varieties of rice analyzed were found to differ in the proportions of the several amino acids they contained. "Increases were obtained in cystine, tryptophan, lysine, arginine, and histidine content of the proteins of rice from plats treated with fertilizers (superphosphate, ammonium sulfate, Ammophoska, NaNO_3 , and sulfur) as compared to the amino acid content of the proteins of rice from untreated plats."

Nitrogen metabolism in hyperthyroidism, B. SURE, Z. W. FORD, JR., R. M. THEIS, and M. GOLDFISCHER. (Ark. Expt. Sta.). (*Endocrinology*, 28 (1941), No. 5, pp. 806-815).—This paper reports a study of the influence of hyperthyroidism in rats on the distribution of the nonprotein nitrogen of the blood, as determined by microchemical methods with the Evelyn photoelectric colorimeter, and on the partition of nitrogen in urine as determined by standard methods with slight modifications which are noted. The influence of glycine on creatine-creatinine metabolism in hyperthyroidism was also determined in a small group of rats. The data obtained are tabulated for individual rats and summarized as follows:

"Subcutaneous daily injections of synthetic (*d-l*) thyroxine produce a disturbance in nitrogenous metabolism, as evidenced not only by an increased total nitrogen output in the urine and a marked creatinuria and reduction of preformed creatinine, but also by pronounced increases in ammonia and uric acid excretion and by an appreciable reduction in the excretion of allantoin. Thyroxinized animals show a marked retention of blood uric acid. The marked reduction of muscle and heart creatine in hyperthyroidism cannot be prevented by massive doses of vitamin A or ascorbic acid. Subcutaneous injections of glycine are followed by small increases in urinary excretion of preformed creatinine and in significant increases in excretion of creatine, but glycine will not prevent the great losses of creatine from the muscles and the myocardium."

Nutrition in relation to eye function, H. S. MITCHELL. (Mass. State Col.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 2, pp. 95-101).—This is a general discussion of the relation to eye function of deficiencies in vitamins (A, riboflavin,

and ascorbic acid) and of metabolism of minerals (calcium and sodium), carbohydrates (glucose, xylose, and galactose), and nitrogen. The information presented is summarized in a table, giving for each of the nutrients discussed the name or description of the eye condition associated with its deficiency or disturbed metabolism and the response to treatment with specific substances or clinical implications. A list of literature references is appended.

Middle and old age in cholesterol-fed rats, R. OKEY. (Calif. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 466-470).—In rats fed diets containing 1 percent of cholesterol from weaning throughout the life span, growth, health, and time of survival did not differ significantly from controls on the same diet without cholesterol. Histological examination of the grossly enlarged and fatty livers resulting from the high cholesterol feeding showed fatty infiltration rather than degeneration of functioning tissues. In animals developing infections or becoming ill from other causes there was a much more rapid disappearance of ester cholesterol from the liver than in animals transferred from a cholesterol-rich to a cholesterol-poor diet.

Effects of simple dietary alterations upon retention of positive and negative minerals by children, I. G. MACY, F. C. HUMMEL, H. A. HUNSCHER, M. L. SHEPHERD, H. J. SOUDERS, ET AL. (*Jour. Nutr.*, 19 (1940), No. 5, pp. 461-476).—In metabolism studies with nine children from 5 to 8 yr. of age, the preexperimental and experimental periods ranged from 20 to 55 consecutive days for each child. The dietary alterations in the experimental period consisted, in the first group, of the addition of 100 gm. of banana to the daily diet; in a second and a third group, which differed in the proportion of apple in the basal diet, 100 gm. of banana were substituted for 10 gm. of white bread and 20 gm. of cereal; and in a fourth group 100 gm. of banana, 30 gm. of potato, 10 gm. of butter, and 50 gm. of white bread were added to the basal diet during the experimental period. By this manipulation of the proportions of banana, apple, and cereal in adequate mixed diets, the intakes of positive and negative minerals were maintained at approximately constant levels for each subject, but the component inorganic elements within the positive (Ca, Mg, Na, and K) and negative (P, S, and Cl) mineral groups were altered. There were only slight alterations in the nitrogen intakes.

The balance data, discussed in some detail, indicate that 100 gm. of banana were more effective than the same amount of apple or 30 gm. of cereal in stimulating the rate of growth. This growth performance was accomplished in spite of the fact that the same intake (per kilogram) of total, positive, and negative minerals was maintained during the high and low banana periods. These results are considered to verify Shohl's thesis (*E. S. R.*, 83, p. 845) that "individual elements, or rather, certain groups of elements, perform separate functions in the body economy, and are therefore more important than the total."

The utilization of the calcium of milk by adults, H. BREITER, R. MILLS, J. DWIGHT, B. McKEY, W. ARMSTRONG, and J. OUTHOUSE. (*Univ. Ill.*). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 351-362).—Calcium metabolism studies designed to determine the utilization of the calcium of milk were conducted on seven healthy adults—four women and three men, ranging in age from 21 to 42 yr. The general plan of the experiment was similar to that of earlier studies on children by Outhouse et al. (*E. S. R.* 82, p. 132) and Kinsman et al. (*E. S. R.*, 82, p. 133), with modifications to meet adult dietary needs and to utilize 5-day metabolic periods. Calcium was fed at two different levels, the lower level, supplied by the basal dietary which was fed for a period of 34 days, furnishing on an average 270 mg. a day. The higher level, received over an additional 24-34 days, was obtained by supplementing this basal dietary with enough pasteurized fluid milk to produce a slightly negative balance. The quantity of milk received by

each subject daily was determined by the magnitude of his calcium losses during the basal period, and ranged from 180 to 500 gm. During the basal period the seven subjects on respective daily total calcium intakes of 248, 264, 278, 274, 281, 309, and 289 mg. were in negative balance to the extent of 67, 88, 80, 67, 120, 65, and 141 mg. During the milk period the daily calcium intakes (of the subjects in the same order) were 451, 568, 574, 580, 498, 603, and 873 mg., with resulting balances of -36, +5, +24, -13, -39, -5, and -22 mg. By relating differences in calcium intakes to the differences in corresponding calcium losses, according to the formula used in the earlier study by Kinsman et al., the following values for the utilization of milk calcium were obtained: 15.3, 30.6, 35.1, 17.6, 30.3, 20.1, and 20.4 percent. Nothing in the data offered explanation for the division of the subjects into high and low utilizers.

The calcium requirement of man: Balance studies on seven adults, J. OUTHOUSE, H. BREITER, E. RUTHERFORD, J. DWIGHT, R. MILLS, and W. ARMSTRONG. (Univ. Ill.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 565-575).—Data from the calcium metabolism studies reported above were used for computation of the calcium requirements of the seven adults whose utilization of milk calcium had been studied. The calcium requirement was computed as calcium intake \pm [calcium balance \times (100 \div % utilization of milk calcium)], the + sign being used for the subjects who were in negative balance and the - sign for those in positive balance. It is pointed out that the data used were secured at levels of intake almost sufficient to induce calcium equilibrium, and that the computation took into account the individual's capacity for utilizing food calcium, as determined in the case of milk. The total respective requirements thus calculated amounted to 686, 552, 506, 654, 627, 628, and 981 mg. of calcium daily for the seven subjects in the order noted in the above study. The average (662 mg. daily), when based on weight, height, and surface area, amounted to 10.7 mg. per kilogram, 3.9 mg. per centimeter, and 391 mg. per square meter. These requirements, calculated on a 70-kg. weight basis, averaged 752 mg., which is 67 percent greater than Sherman's 450-mg. requirement. The latter figure is considered too low, however, because it was predicated on the assumption that adults utilize 100 percent of their dietary calcium.

Further experiments on the calcium requirement of adult man and the utilization of the calcium in milk, F. R. STEGGERDA and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 577-588).—In continuation of a study reported earlier (E. S. R., 81, p. 739), 25 calcium balance periods extending over 12-32 days each were carried out on nine adult men. All subjects showed negative balances in the preliminary periods in which they received basal diets furnishing on an average 203 mg. of calcium daily. In subsequent periods the basal diet was supplemented with milk products (liquid whole milk, liquid skim milk, "dry milk solids," and homogenized milk) in amounts to provide enough calcium for approximate equilibrium. Comparisons of the balance data secured in basal and test periods gave indication of the amount of the supplemental calcium utilized. The utilization, calculated as percentage of the total calcium in the milk supplement, averaged 29 percent, although the individual averages, in increasing order, were 18, 19, 21, 21, 25, 28, 32, 36, and 49 percent. There was no evidence that calcium from the various milk products was utilized with different degrees of efficiency. In particular, the commercial desiccation of milk or its homogenization did not appreciably impair biological utilization of its calcium.

The calcium requirement for equilibrium, calculated essentially as noted above in the study by Outhouse et al., averaged 9.55 ± 0.46 mg. daily per kilogram of body weight, or 357 ± 15 mg. per square meter of body surface. This require-

ment related to diets in which about two-thirds of the calcium content was furnished by milk products. It is pointed out that this value agrees well with the estimate of I. Leitch⁴ of 10.0 mg. per kilogram of body weight for women and with the estimate of Mitchell and Curzon⁵ of 9.75 mg. per kilogram of body weight, but that it is 50 percent higher than Sherman's estimate (E. S. R., 44, p. 563) of 0.45 gm. per 70 kg. of body weight. The latter estimate is considered too low, since it was derived without consideration of the close positive correlation between intake and excretion of calcium.

"The dangers attending the use of any average calcium requirement of maintenance in assessing the prevalence in a community or population of calcium undernutrition are discussed."

The effect of calcium and phosphorus on the metabolism of lead, J. B. SHIELDS and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 541-552).—The retention of lead as affected by variation in the content of calcium and phosphorus in the diet was investigated in a series of experiments involving 128 growing or adult rats fed diets containing low concentrations of lead (16-32 p. p. m.). While the concentration of dietary lead was held constant in any given experiment, the concentration of calcium or phosphorus, or both, was varied in the series of diets. Food intakes of rats on comparable diets were equalized, the amounts of food consumed per rat being generally 500, 600, or 1,000 gm. This permitted the interpretation of results in terms of the relative compositions of the diets. The retentions of lead, and of calcium and phosphorus also in some experiments, were measured by carcass analysis.

The results are interpreted as indicating that a low content of calcium or phosphorus, or of both, in the diet induced a high retention of lead in comparison with diets with higher mineral levels. Lead storage on the diet with a moderate amount of lead (32 p. p. m.) occurred in adult rats only when the calcium content was lowered to inadequate or borderline levels (0.03-0.12 percent). With moderate levels of dietary lead, excessive levels of dietary calcium and phosphorus did not offer special protection against assimilation of lead by the body. Under the imposed conditions of variable dietary calcium and phosphorus levels, the retention of calcium varied in a way diametrically opposed to that of lead. "Under conditions of practical nutrition, an adequate intake of calcium and of phosphorus presumably protects the body against appreciable assimilation of the low levels of dietary lead involved in the usual lead hazard of modern life. This protection is more effective in the adult than in the adolescent for any given concentration of calcium and phosphorus, possibly because the mineral metabolism of the bone trabeculae is considerably less intense in the adult than in the growing organisms."

Fasting catabolism and food utilization of magnesium deficient rats, M. KLEIBER, M. D. D. BOELTER, and D. M. GREENBERG. (Univ. Calif.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 363-372, fig. 1).—In this study, parallel to one reported earlier on calcium deficiency (E. S. R., 85, p. 417), 10 rats were placed on a magnesium-deficient diet when 36 days old, allowed unlimited food intake for 5 days, then paired according to weight and fasting catabolism, and one animal continued on the magnesium-deficient diet (2.06 mg. Mg per 100 gm. food) ad libitum, while the pair mate was fed the magnesium-supplied control diet (84 mg. Mg per 100 gm.) in restricted amounts (83 percent of that consumed by the deficient rat) to keep weight gain essentially equal to that of the deficient animal. Fasting catabolism was measured twice in the 5-day preliminary period

⁴ Nutr. Abs. and Rev., 6 (1937), No. 3, pp. 553-578, figs. 4.

⁵ The dietary requirement of calcium and its significance, H. H. Mitchell, with collab. of E. G. Curzon. Paris: Hermann & Co., 1939, pp. 103, fig. 1.

and three times during the main part of the experiment, which was terminated when the rats were 98 days old.

The rats on the deficient diet gradually lost appetite and after 60 days on the regime ceased to grow. Magnesium-deficient and control rats were similar as to water, ash, fat, and protein content, but the carcasses of the deficient animals contained only half as much magnesium as the control rats. Body length was essentially the same in the two groups of rats, but dry weights of heart and liver were greater and those of thyroid and adrenal glands significantly greater in the magnesium-deficient rats than in the controls supplied with magnesium. The fasting catabolic rate of the deficient rats amounted to 125 percent of the rate of the controls 57 days after the pairing of the rats. Analysis of weight gains with respect to food intake indicated that energy and protein were less efficiently utilized by the magnesium-deficient rats, the extra waste, in comparison with the control group, amounting to about 18 percent of the intake. The increased rate of fasting catabolism was not sufficient to explain the extra waste of energy. It is concluded, therefore, that the magnesium deficiency caused an increased loss of unoxidized material in the excreta, or increased the calorogenic action of the food.

Iron metabolism in human subjects on daily intakes of less than 5 milligrams, R. M. LEVERTON. (Nebr. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 617-631, figs. 2).—Iron metabolism studies were conducted on four healthy college girls for periods of from 3 to 8 mo. The basal diet was adequate in all known dietary essentials except that it furnished only 3.5-4.5 mg. of iron daily. Food iron intake, and iron losses through (1) urinary excretion, found to be low and constant for each subject, (2) fecal excretion, and (3) loss in the menses were determined by analyses of aliquots of composite samples of the respective materials. Dietary management and sample analysis, discussed in some detail, were conducted with great care to preclude iron contamination. Serum iron values were followed in order to study the relation of level of intake and excretion to endogenous iron metabolism, and certain blood determinations were made periodically.

Fecal excretions did not exceed the iron intake, thus indicating that the intestine normally does not excrete iron. At all times on the low-iron diet the total of fecal, urinary, and menstrual iron losses exceeded the intake, so that the body was losing iron from storage depots. On a daily iron intake of 3.50 mg. the body loss of iron averaged 0.33 mg. daily. When the 750 cc. of milk of the basal diet of three subjects was replaced by 116 gm. of lean beef, which furnished an equivalent amount of protein, the iron content of the diet was thereby increased to 6.55 mg., and the iron balance changed from negative to positive, with an average daily retention of 2.14 mg. of iron. Hemoglobin, cell volume, and red blood cell, white blood cell, and differential counts remained throughout the study within the limits of normal variations, and reflected, therefore, no measurable effects of either the low-iron diet or its supplements. Serum iron, however, decreased consistently and significantly on the low-iron regimen, but whenever the iron intake was increased, by substitution of beef for milk in the basal diet or by shift to freely chosen diets, the serum iron levels rose markedly, only to drop again when the low-iron intake was resumed. These results suggested the possibility of conducting iron metabolism studies by determining serum iron values during different levels of iron intake. Although the study did not definitely establish the adequacy of 6.5 mg. of iron daily for young women in general, it is suggested that there is no need for emphasis on amounts exceeding that figure; rather emphasis should be placed on liberal amounts of other dietary essentials.

Correlation of histological differentiation with beginning of function of developing thyroid gland of frog, A. GORBMAN and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 103-106, fig. 1).—The stage of differentiation at which thyroid gland first exhibited the ability for storage of iodine was studied in an experiment using tadpoles of the frog, *Hyla regilla*, placed in water to which radio-iodine was added as the sodium salt. The accumulation of radio-iodine in thyroid tissue was revealed by placing sections of tissue in contact with X-ray films. The findings indicated that in this frog function of the thyroid began very early after formation of follicles within each of the two primitive, still yolk-laden lobes. It is pointed out that the iodine in the serial sections which produced the radio-autographs had remained in the thin section even after immersion in aqueous and alcoholic solutions, in alcohol-ether, and xylene, and that the iodine was, therefore, very likely in an organic linkage, probably as thyroglobulin.

Nutritional factors concerned in rusting of albino rats, H. S. OWENS, M. TRAUTMAN, and E. WOODS. (Univ. Idaho). (*Science*, 93 (1941), No. 2417, pp. 406-407).—It is noted briefly that rusting of the fur of albino rats has been produced in the absence of choline or pantothenic acid and has been prevented by supplementing the diet, presumably adequate in the other vitamins of the B complex, with at least 40 μg . of pantothenic acid and 20 μg . of choline. The minimum quantity of the latter necessary to prevent rusting was not determined. "The implication is that no matter what the factors are that prevent development of rustiness in albino rats, the liver must play an important role in their metabolism."

The choline content of rats on various choline-free diets, H. P. JACOBI, C. A. BAUMANN and W. J. MEEK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 571-582, fig. 1).—When 26 rats weighing from 38 to 55 gm. were taken from the stock diet and fed on various experimental diets until they had increased their weight at least threefold, this was found to require from 3.7 to 17.6 weeks on the various diets. At the beginning of the experiment the choline content of the animals ranged from 38 to 51 mg., averaging 43 mg. After from 8 to 18 weeks on the choline-free diet, the animals contained from 118 to 209 mg. (average 151 mg.) of choline, as much as 76 mg. having been synthesized in 8 weeks by one animal. Animals raised on the stock diet contained about the same amount of choline as rats of similar weight on the choline-free diet. Choline synthesis was reduced somewhat on a diet high in fat, but other variations in the low-choline diet, such as high protein, high cystine, and a change of protein, as well as the addition of choline, had little or no effect on the choline content of the tissues. The increase in any one tissue or in the entire animal paralleled the increase in weight recovery, roughly from 0.8 to 0.9 mg. of choline being present per gram of rat whether choline was supplied in the diet or not.

The method described for the determination of choline involved extraction of the sample with an alcohol-ether mixture and hydrolysis of the concentrated extract with barium hydroxide, followed by neutralization with acetic acid and removal of insoluble material by filtration. Choline was precipitated from the filtrate with ammonium reineckate in methanol. Choline reineckate, separated from other reineckates by virtue of its insolubility in water and ethyl alcohol, was dissolved in acetone, in which it gave a red solution, and was determined colorimetrically in an Evelyn photoelectric colorimeter. The results agreed satisfactorily with those determined by a highly specific biological method (described in detail) involving the contraction of the rectus abdominis muscle of the frog in the presence of acetylcholine and eserine.

Improved diets for nutritional and pathologic studies of choline deficiency in young rats, R. W. ENGEL and W. D. SALMON. (Ala. Polytech. Inst.).

(*Jour. Nutr.*, 22 (1941), No. 2, pp. 109-121, pls. 2).—Of seven diets on which choline deficiency was produced in rats, the most successful with respect to growth, as well as production of choline deficiency symptoms, consisted of alcohol-extracted peanut meal 30, extracted casein 6, sucrose 54, salt mixture 4, and lard 6 percent, with daily supplements of 20 μ g. each of thiamin chloride, pyridoxin, and riboflavin, and factor 2 concentrate equivalent to 1 gm. of liver, and weekly supplements of vitamins A and D as β -carotene and calciferol. On this diet severe symptoms were produced in all of the animals in from 6 to 10 days, while controls receiving 20 mg. of choline chloride daily remained normal and gained about 3 gm. daily. Cystine added to this diet failed to stimulate growth.

The symptoms and signs of the deficiency condition are described as drowsiness and inactivity, palpably enlarged kidneys, and abdominal distention, usually with death resulting within 48 hr. after the appearance of the first symptom and preceded by several minutes of extremely labored breathing, tremors, coma, loss of normal skin color, and lowered temperatures. Less common symptoms were diarrhea and eye hemorrhage originating in the ciliary vessels and spreading into the posterior chamber. Uremia was indicated by high nonprotein nitrogen in the blood and positive xanthidrol reaction. On autopsy the kidneys, which averaged 100 percent more in weight than those of the positive controls, were greatly enlarged, firm, bright red in color, and hemorrhagic, with thickened capsule; the livers pale and fatty; and the thymus atrophied. Hemorrhagic foci were frequently present in the heart, muscle, adrenal cortex, and lungs, and in many animals the lumbar and sacral lymph nodes were filled with blood. The spleen varied in appearance from swollen and bright red to shrunken and pale. Rats surviving the acute attack resumed growth and lived for several weeks to several months, but showed on autopsy pitting and scarring of the kidney surface. Animals suffering less severely were able to make an apparently complete recovery.

"The data presented here are of importance in relation to nutritional investigations where purified diets are employed. Subacute cases of choline deficiency could easily be overlooked, since such animals appear quite normal and palpably enlarged kidneys is the only reliable symptom. Routine choline supplements to purified diets for the rat would appear essential on the basis of the present findings."

How to control vitamin content (*Food Indus.*, 13 (1941), No. 6, pp. 35-66, figs. 35).—This symposium of experience and judgment by those who deal with vitamins in foods on an industrial scale is presented to show the complexity and cost of such control, to review industrial practices, and to present facts in proper balance. Quality control is defined as the problem of producing a uniform product rather than getting as much vitamin as possible into the product. Prevention of vitamin losses, and problems pertaining to materials, technology, equipment, plant operation, control, patents, and management are cited as problems involved in vitamin content control. Most foods are considered as worthy of consideration for improvement either by improved processing methods to conserve the original vitamin content or by enrichment with added vitamins. The following papers are presented: How to Add and Control Vitamin A in Margarine, by H. W. Vahlteich; How to Add Vitamin D Concentrate and Control Vitamin D in Milk, by C. I. Post; Irradiation and Control of Vitamin D in Milk, by K. C. Weckel (Univ. Wis.); How to Get Vitamin D into Milk by Feeding Cows Yeast, by C. N. Frey; Irradiation and Control of Vitamin D in Cereals, by F. L. Gunderson; How to Conserve Vitamin C in a Liquid, by P. F. Sharp, D. B. Hand, and E. S. Guthrie (Cornell Univ.); How to Add B Vitamins and Control Content in Flour, by C. H. Bailey (Univ. Minn.); How B. A. Eckhart Milling Co. Makes Enriched Flour, by W. G. Epstein; Addition and Control

of Vitamin B₁ in Cereals, by F. N. Peters; Vitamin Control for Baking Industry, by R. T. Bohn; How to Sample Bread for Vitamin Assay, by L. W. Haas; How to Sample Flour for Vitamin Assay, by W. L. Heald; Role of Independent Laboratory in Product Control, by B. L. Oser; Quick Review of Chemical Methods for Determining Vitamins, by A. W. Thomas; Use of Yeast in Vitamin Control, by L. Atkin, A. S. Schultz, and C. N. Frey; and Control of Nicotinic Acid in Flour and Bread, by B. L. Oser, D. Melnick, and L. Siegel.

The number of vitamins required by the rat, L. R. RICHARDSON, A. G. HOGAN, B. LONG, and K. I. ITSCHNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 530-532, fig. 1).—A diet described previously (E. S. R., 84, p. 851) as promoting a moderate rate of growth with only purified sources of the B vitamins (thiamin, riboflavin, vitamin B₆, and calcium pantothenate) has been further improved by increasing the quantities of these vitamins and adding choline. Ration C, embodying these changes, consists of casein 20, sucrose 65, lard 8, salt mixture 4, and cellulose 3 parts, supplemented by a concentrate of vitamins A and D in amounts of 3 mg. per rat daily, and for every 100 gm. of the ration α -tocopherol 2.5, thiamin 0.8, riboflavin 1.6, vitamin B₆ 1.2, calcium pantothenate 1.0, and choline 400 mg.

"At present it seems that the eight vitamins included with ration C are all that the rat requires to attain normal weight maturity, though it is possible that the basal ration may conceal some unsuspected vitamin. However that may be, in any search for unrecognized vitamins an examination of the quantitative interrelations of the recognized vitamins is of crucial importance."

The effect of certain carcinogens on vitamin A in the liver, C. A. BAUMANN, E. G. FOSTER, and P. S. LAVIK. (Wis. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 5, pp. 431-444).—Rats were injected with carcinogenic and similar noncarcinogenic compounds, and the storage of vitamin A in their livers was compared with that of nontreated animals fed the same amount of vitamin A.

Dibenzanthracene, an active carcinogenic agent, injected intraperitoneally in colloidal form increased the rate of depletion of liver stores of vitamin A and interfered with the entrance of the vitamin into the liver. A similar increase in vitamin A depletion followed the subcutaneous injection of dibenzanthracene in oil. Methyl cholanthrene, a more potent carcinogenic substance, also reduced liver stores of vitamin A but to a less rather than a greater extent than dibenzanthracene. Benzpyrene, another potent carcinogen, and 1,2-benzanthracene, a noncarcinogenic hydrocarbon, also reduced liver stores to a less degree than dibenzanthracene. Butter yellow, which is carcinogenic, and carbon black, which is noncarcinogenic, had no effect on vitamin A storage. The livers of rats with spontaneous tumors contained more vitamin A than the livers of nontumorous controls, but the livers with tumors due to methyl cholanthrene contained more vitamin A than those of nontumorous rats treated with dibenzanthracene.

It is concluded that there is no correlation between the carcinogenicity of the compound and its effect on vitamin A, and that decreased vitamin A is not a necessary prerequisite to tumor formation.

The effect of certain fats and unsaturated fatty acids upon the utilization of carotene, W. C. SHERMAN. (Ala. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 2, pp. 153-165, figs. 2).—Young rats were depleted of their vitamin A stores essentially as described previously (E. S. R., 84, p. 731) and then tested for their growth response to highly purified coconut, wheat-germ, cottonseed, linseed, and soybean oils in doses of 0.5 cc. daily and to carotene in amounts of 1 or 2 μ g. daily alone and with 0.1 cc. of decolorized butterfat or one of the above oils. In the absence of carotene all of the animals lost weight and died within 5 weeks, showing severe ophthalmia. Growth on carotene alone was exceeded only slightly

by growth on carotene supplemented with coconut oil and butterfat, but was definitely increased by wheat-germ oil, corn oil, linseed oil, and cottonseed oil. A still greater increase was obtained with soybean oil at both levels of carotene intake.

As the most obvious difference between the oils which did and did not promote growth was in their content of essential unsaturated fatty acids and there was some evidence in dry scaliness of the skin of a deficiency of unsaturated fatty acids, methyl linolate and methyl linolenate, esters of unsaturated fatty acids, were tested in a similar manner to the oils. With low levels of carotene both of the esters showed an antagonistic effect, growth being less than on carotene alone. In the presence of soybean oil the antagonistic effect of methyl linolate was overcome, as also appeared to be the case when larger quantities of carotene were fed or when the carotene and methyl linolenate were fed separately several hours apart. Carotene analyses of the feces showed that the differences in the growth response could not be explained on the basis of differences in the effect of the oils on the absorption of carotene.

Vitamin B₁ (thiamine chloride).—Annotated bibliography (*Rahway, N. J.: Merck & Co., 1941, [rev.], pp. [3]+140*).—This revision, dated April 1941, of an earlier bibliography (*E. S. R., 83, p. 417*) is classified under the headings chemical investigation and description, physiological activity (in vitro, bacteria, plants, experimental animals, and man), occurrence, place in nutrition, clinical uses (in beriberi, neurological diseases, cardiovascular diseases, and miscellaneous diseases and reviews), toxicity, and methods of assay (biological and chemical).

Nicotinic acid (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+19*).—This supplement, dated September 1941, to the bibliography noted previously (*E. S. R., 85, p. 702*) is classified under the headings chemical investigation and description, physiological activity (animal experimentation, man, and bacteria), occurrence, place in nutrition, clinical uses (in pellagra, neurological diseases, and miscellaneous conditions), and methods of assay (chemical and biological).

The effect of a nicotinic acid deficiency upon the coenzyme I content of the human erythrocyte and muscle, A. E. AXELROD, T. D. SPIES, and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem., 138 (1941), No. 2, pp. 667-676*).—Erythrocyte and muscle coenzyme I values were obtained by methods previously described (*E. S. R., 82, p. 727*) for a series of normal and pellagrous subjects and for the latter after the administration of nicotinic acid pyrazinemonocarboxylic acid, and coramine. In addition, in vitro synthesis of coenzyme I in defibrinated blood from normal subjects by nicotinic acid amide, coramine, quinolinic acid, and pyrazinemonocarboxylic acid was attempted.

The coenzyme I content of the erythrocytes showed no significant decrease and that of the striated muscle a significant decrease in advancing stages of pellagra. Values for the erythrocytes averaged 85 $\mu\text{g.}$ per cubic centimeter in 45 normal controls and between 70 and 90 $\mu\text{g.}$ in 5 cases of severe pellagra. Striated muscle values showed a decrease from an average of 382 $\mu\text{g.}$ per gram of fresh muscle in 9 normal subjects to 214 $\mu\text{g.}$ per gram in 5 severe cases of pellagra. All three forms of therapy improved the clinical condition of pellagrins. Nicotinic acid therapy brought about an increase in the coenzyme I content of both erythrocytes and muscle, coramine resulted in no change in the 1 patient studied, and pyrazinemonocarboxylic acid an increase in erythrocyte values in 1 and in muscle values in another of 3 patients studied. Of the four compounds tested only nicotinic acid amide was capable of synthesizing coenzyme I in defibrinated blood.

Pantothenic acid requirement of the rat, K. UNNA (*Jour. Nutr., 20 (1940), No. 6, pp. 565-576, figs. 3*).—Pantothenic acid prepared from pure "natural" α -hydroxy- β , β -dimethyl- γ -butyrolactone, and β -alanine was used in curative and

prophylactic tests on rats maintained on a synthetic vitamin B complex-free diet supplemented with the synthetic crystalline factors of the B complex, 40 μg . each of thiamin, riboflavin, and vitamin B₆ and 5 mg. of choline chloride per rat per day, with, in some cases, a further supplement of 0.5 mg. of nicotinic acid amide.

On the basal diet alone young rats ceased to grow after 3 or 4 weeks, and starting at the second week developed a rough, thin fur with rusty spots, excessive nasal secretion, sores around the mouth, and blood caking on the whiskers. The survival period ranged from 25 to 60 days. On autopsy, some of the animals showed hemorrhages under the skin and into the adrenal cortex. In curative tests, single doses were ineffective or irregular up to 840 μg . on which 7 out of 10 rats gave a uniform growth response of about 3 gm. daily for from 4 to 5 days, with renewal of growth at about the same rate and at about the same length of time with a repetition of the dose. With daily feedings of graded doses of the pantothenic acid, 50 μg . was required to prevent a mortality of at least 50 percent of the animals within 2 weeks. On 50, 100, and 150 μg ., 70 percent survived in each group and growth was proportional to the dose. In prophylactic tests, 80 μg . per rat per day sufficed for optimal growth. A liver preparation containing 150 μg . of pantothenic acid was about as effective as the same amount of the pure pantothenic acid in the curative tests but promoted growth at a greater rate in both therapeutic and prophylactic tests.

It is pointed out that almost all of the deficiency symptoms developing on the diet deficient only in pantothenic acid have been observed previously on animals on a diet devoid of the filtrate factor. The most consistent symptom observed in the present study, however, was the condition of the fur, and improvement in external symptoms with administration of pantothenic acid was most noticeable in the fur, although the response was not nearly as prompt as the improvement in the acrodynia lesions following the administration of vitamin B₆.

Effect of pantothenic acid on the nutritional achromotrichia, K. UNNA and W. L. SAMPSON (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 309-311).—Graying of the hair was produced within 4 weeks in approximately 80 percent of a group of black and piebald rats on a diet of vitamin-free casein 18, sucrose 67, butterfat 9, salt mixture 4, and cod-liver oil 2 percent, supplemented with thiamin, riboflavin, nicotinamide, and vitamin B₆. At the same time the weights became stationary and the characteristic signs of pantothenic acid deficiency, as noted above, appeared. The amount of calcium pantothenate shown in the earlier report to be essential for optimum growth, 80 or 100 μg ., prevented graying of the fur, while doses of 5, 10, or 20 μg . were ineffective and doses of 40 μg . gave inconsistent results. Comparable results were obtained with various concentrations of rice bran and liver, their effectiveness in preventing any graying of the hair paralleling closely their content of pantothenic acid as determined by bacteriological assay. The growth rate of rats on the rice bran was markedly superior to that of animals on pantothenic acid.

In curative tests conducted on rats which had been kept on the deficient diet for from 6 to 10 weeks, calcium pantothenate in daily doses of 100 μg . produced a striking growth stimulation, with a somewhat slower response in the cure of external symptoms to blackening of the hair. The symmetric gray pattern disappeared gradually within from 3 to 5 weeks.

Pantothenic acid (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+7*).—A supplement under the date of July 1941 to the bibliography noted previously (E. S. R., 85, p. 704).

A study of urinary riboflavin excretion in man, A. E. AXELROD, T. D. SPIES, C. A. ELVEHJEM, and V. AXELROD. (Univ. Wis. et al.). (*Jour. Clin. Invest.*,

20 (1941), No. 2, pp. 229-232).—The seven subjects in this study were patients in a Birmingham, Ala., hospital. Five in the nutrition clinic were suffering from multiple vitamin deficiency and were maintained during the period of observation on diets deficient in various members of the B complex. The other two, serving as controls, were in a good state of nutrition and were kept on the regular hospital diet. The riboflavin content of aliquots of 24-hr. samples of urine collected in dark bottles containing 1 cc. of glacial acetic acid and stored in the refrigerator under toluene was determined by the microbiological method of Snell and Strong (E. S. R., 82, p. 587). Saturation tests were also performed using 200 $\mu\text{g.}$ of riboflavin per kilogram body weight for all but one subject, who received 400 $\mu\text{g.}$ The vitamin was administered intravenously.

The average daily riboflavin excretions of the patients on the deficient diets were 59, 61, 58, 91, and 65 $\mu\text{g.}$, respectively. For each subject the variation from day to day was small. The two controls gave values of 236 and 270 $\mu\text{g.}$, respectively. No correlation could be found between the daily excretion of riboflavin and the response to the test dose. The percentages of the test dose excreted were 72 (test dose 400 $\mu\text{g.}$), 51, 37, 63, 10, and 10 percent, respectively. Thus, the subject excreting on an average 65 $\mu\text{g.}$ and the one excreting 236 $\mu\text{g.}$ excreted the same percentage of the same test dose. In the subjects whose urines were tested at frequent intervals during the 24-hr. period, from 30 to 40 percent of the administered riboflavin was excreted within 1 hr. after injection in three subjects receiving 200 $\mu\text{g.}$ per kilogram body weight, and 42 percent within 3 hr. in one subject receiving a test dose of 400 $\mu\text{g.}$ per kilogram body weight. "The lack of correlation between the daily urinary excretion of riboflavin and the degree of retention of administered riboflavin makes it evident that the riboflavin 'saturation' test, as carried out under our conditions, has but little diagnostic value in subjects with a riboflavin deficiency which is complicated with other vitamin deficiencies."

Relation of dietary fat to riboflavin requirement of growing rats, G. L. MANNERING, M. A. LIPTON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 100-104, figs. 2).—The basal riboflavin-low ration K_{21} of Wagner et al. (E. S. R., 85, p. 297) and two modifications in which the fat content had been raised to 25 and 40 percent, respectively, by substituting lard isodynamically for dextrin were further supplemented by choline to the extent of 5 mg. per 100 gm. in diet K_{21} and isocaloric equivalents in the other two diets. Albino rats weighing from 60 to 75 gm. were partially depleted of their riboflavin reserves by keeping them on these three diets (12 animals on each) for 4 weeks, at the end of which time 4 animals in each group were given 3 γ and 4 6 γ of riboflavin daily and the remaining 4 continued on the same ration. The composite growth curves of each of the 3 groups showed decreased growth with increased fat content of the diet. The physical signs of riboflavin deficiency (loss of hair and dermatitis) were noted to increase in degree with higher fat content, and the animals developed a spastic gait due to a paralytic condition. Cataracts similar to those described by Day et al. (E. S. R., 78, p. 570) were observed in several of the animals on the high-fat diets. Animals in the final stages of deficiency responded to riboflavin in doses of 20 γ and 40 γ daily, with rapid increase in weight and cure of symptoms.

A second series of rats weighing from 30 to 40 gm. was partially depleted on rations K_{21} and K_{22} (25 percent fat) in which choline and vitamin B_6 had been doubled and crystalline pantothenic acid added at a level of 500 γ per 100 gm. of the ration. At the end of 2 weeks the rats on diet K_{22} weighed less than those

on the low-fat diet K_{21} . Riboflavin was then fed at levels of 0γ , 6γ , 18γ , and 54γ per day for 5 weeks. The animals receiving no riboflavin showed greater gains on the low-fat diet than on the high. The differences became less with increasing riboflavin supplements. On 18γ the growth was only slightly less on the high-fat than on the high-carbohydrate ration and on 54γ was equally good on both.

From these tests and an additional free-choice test in which rats which had been kept on a high-fat diet voluntarily selected the high-carbohydrate diet in preference to continuing on the high-fat diet, the authors conclude that fat has an antagonistic effect on riboflavin and suggest two possible explanations for further consideration, namely, "(1) increasing the level of fat in the diet may alter the intestinal flora so that less than normal bacterial synthesis or more than normal bacterial destruction of riboflavin occurs, or (2) riboflavin may be directly concerned with fat metabolism or phosphorylation."

[Avitaminosis, XX-XXII]. (Ark. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 5, pp. 445-452, 453-460; 22 (1941), No. 3, pp. 295-301, fig. 1).—In continuation of the series (E. S. R., 78, p. 891), three papers are presented.

[XX]. *The sparing action of thiamine on body tissue catabolism*, B. Sure and M. Dichek.—In this extension of earlier work on the specific effect of vitamin B_1 on growth (E. S. R., 68, p. 705), in which concentrates of the vitamin were employed, the same paired feeding technic with slight modifications was followed with the various B vitamins supplied as far as possible in the pure form.

In three series of tests employing two different diets, weight losses were compared of animals receiving no thiamin and their paired mates receiving the same quantity of the basal diet supplemented with $20\ \mu\text{g.}$ daily of thiamin. The weight losses of the thiamin-deficient animals were more than four times as great as those of the controls, thus showing a pronounced sparing effect of the thiamin on tissue metabolism. In another series a similar comparison was made of animals receiving enough thiamin for slow but not optimal growth with paired mates receiving $20\ \mu\text{g.}$ of thiamin. There were no marked differences in growth rates of the animals in each pair, but in a subsequent period in which no thiamin was administered the losses in weight were much greater in the animals which had received the suboptimal dosage of thiamin. In a final series one animal in each pair received a maintenance dose and the other $20\ \mu\text{g.}$ of thiamin daily. The extra amount of thiamin in this case promoted no additional growth.

[XXI]. *Riboflavin as a factor in economy of food utilization*, B. Sure and M. Dichek.—In this study, in which the authors had the assistance of M. M. Citron, the same general technic in paired feeding was followed as in the previous study, with two series of experiments on three diets differing in their sources and proportions of the various constituents of the B complex other than riboflavin. Riboflavin was administered to all controls in $20\text{-}\mu\text{g.}$ daily doses. On all of the diets there was some growth without the added riboflavin, thus indicating that the diets were not absolutely free from this factor. However, the growth was in all cases much greater for the controls than for the animals receiving no additional riboflavin. At the end of the experiment 20 pairs of rats selected from the two series were analyzed for changes in body weight and composition of body gains. In total gains in weight and in fat and protein gains the riboflavin-fed animals exceeded the controls, the gains being particularly marked in the fat. Changes in the ash content were too small to be considered of any significance. Attention is called to similar results reported earlier by Braman et al. (E. S. R., 73, p. 414) in spite of the fact that the earlier studies were conducted before pure riboflavin was available.

[XXII]. *Further observation on riboflavin as a food factor in economy of food utilization*, B. Sure.—In this extension of the above study, evidence was obtained indicating that the final collapse in riboflavin deficiency in rats is not associated, as in thiamin deficiency, with anorexia, with anorexia and failure to eat. There may be a moderate reduction, no reduction, or even an increase in food consumption in the final stages. It was found preferable to use somewhat larger animals, 55–70 gm. initial weight, than in the earlier study in order to demonstrate the greatest influence of riboflavin on food utilization. In the 10 pairs of rats used in the present study the average gains in body weight during an average experimental period of 125 days were 6.1 gm. per rat for the riboflavin-deficient animals and 61.3 gm. for the animals receiving 20 μ g. of riboflavin daily.

The pathological symptoms noted in the riboflavin-deficient animals are described as “alopecia, frequently accompanied by dermatitis and ulcerations in the denuded areas, rough hair, conjunctivitis, and keratitis, occasionally associated with a discharge of a granular exudate, and in the terminal stages, muscular incoordination evidenced by the animals walking on their tiptoes and their inability to balance properly on the hind legs. Premature senility is apparent in all cases of advanced stages of riboflavin deficiency.”

Vitamin B₆ (pyridoxine) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+11*).—This supplement, dated August 1941, to the previously noted bibliography (E. S. R., 85, p. 703) is similarly classified. An author index is appended.

The biological estimation of pyridoxine (vitamin B₆), T. W. CONGER and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 138 (1941), No. 2, pp. 555–561, figs. 2*).—The method described is based upon the comparative growth response of vitamin B₆-depleted rats to supplementation of the basal diet with graded doses of pyridoxin and with the substance to be assayed. Two basal rations are described, each of which contains sucrose 75, casein (Labco) 18, salt mixture 4, and corn oil 3 gm., and thiamin 0.20, riboflavin 0.30, and nicotinic acid 2.5 mg. In addition ration I contains 30 mg. of choline, and a fuller's earth filtrate of a butanol extract of 1:20 liver concentrate powder (the preparation of which is described) is administered as a daily supplement at a level equivalent to 0.4 gm. of the original powder; and ration II contains 200 mg. of choline, 0.50 mg. of pantothenic acid, and 250 mg. of the liver concentrate powder. All of the animals are given 2 drops of haliver oil weekly.

Male rats placed on the deficient rations at 21 days show a definite plateau in growth rate in 2 or 3 weeks on ration I and in from 4 to 6 weeks on ration II, at which point the supplements are fed. The growth response shows a linear relationship to the level of pyridoxin, which is customarily fed at levels of 2, 5, and 10 μ g. daily. On the rations described no dermatitis has been noted during the depletion period. If the casein level is increased to 30 percent at the expense of sucrose, typical dermatitis results in from 4 to 6 weeks. It has not yet been determined whether the higher levels of protein increase the vitamin B₆ requirement or are only related to the production of dermatitis.

The pyridoxin content as thus determined is given for a few preparations.

The distribution of pyridoxine (vitamin B₆) in meat and meat products, L. M. HENDERSON, H. A. WAISMAN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr., 21 (1941), No. 6, pp. 589–598*).—The method of assay was essentially that of Conger and Elvehjem noted above. The growth response of male albino rats receiving the basal ration, which was devoid of vitamin B₆ but contained adequate amounts of the other vitamins, plus supplements of the meat under test was compared with the response of negative control animals receiving the basal ration only, and with that of standard controls receiving the basal ration supplemented with crystalline vitamin B₆ at levels of 50, 75, and 100 μ g.

per 100 gm. of ration. The assay period extended over 5 weeks. Meat supplements or the crystalline vitamin were added to the ration of the several groups after the first 2 weeks, which served as a depletion period on the basal diet alone.

The results of the bio-assays of the various kinds of organ and muscle tissues are reported on dry- and fresh-weight bases. Kidney and muscle were the richest sources, containing from 20 to 30 $\mu\text{g.}$ per gram dry basis (from 3 to 7 $\mu\text{g.}$ per gram fresh basis), while heart and liver were somewhat lower, with from 10 to 15 $\mu\text{g.}$ per gram dry basis (from 2.5 to 3.5 $\mu\text{g.}$ per gram fresh basis), except for one sample of beef liver which was more like kidney and muscle. Spleen, pancreas, brain, and lung were poor sources, containing less than 8 $\mu\text{g.}$ per gram on the dry basis. Of the cooked meats, the fried samples showed least destruction, but roasting and stewing caused losses of from 20 to 50 percent. Commercial processing (drying and tenderizing) of various meat samples resulted in similar losses. Fish muscle, like beef, lamb, pork, and veal, was rich in the vitamin, but dark chicken muscle was a poor source. One sample of yellow corn contained 4.8 $\mu\text{g.}$ of pyridoxin per gram, wheat germ contained 15.9 $\mu\text{g.}$ per gram, almost as much as most muscle meats (dry basis), and a sample of winter milk contained 1.3 $\mu\text{g.}$ per cubic centimeter.

Physiologic activity and clinical use of ascorbic acid (vitamin C) (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+59*).—This review, dated July 1941, is classified under the headings chemical and physical properties, history, occurrence, physiologic activity, nutritional requirements, clinical uses, dosage and methods of administration, toxicity, and methods of assay. The literature references are assembled as a bibliography of 145 titles.

Coniferennadeln und deren Absude als Vitamin C-Träger [Conifer needles and their water extracts as carriers of vitamin C], A. SCHEUNERT and J. RESCHKE (*Klin. Wchnschr., 19 (1940), No. 38, pp. 976-979*).—The vitamin C content, determined by a titrimetric procedure, was found to vary from 50 to 250 mg. percent in the various conifer needles analyzed; most of the samples, however, contained from 150 to 200 mg. percent. Storage of the needles resulted in destruction of vitamin C, the loss becoming appreciable upon long storage. As much as 50 percent of the vitamin was removed from pine and spruce needles by water extraction, but not more than one-third was thus removed from needles of the silver fir.

Alpha tocopherol (vitamin E) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+92*).—In this revision, dated May 1941, of the bibliography noted previously (E. S. R., 85, p. 712), the annotated references are similarly classified. An author index is appended.

Vitamin E activities of some compounds related to α -tocopherol, M. TISHLER and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem., 139 (1941), No. 1, pp. 241-245*).—Compounds closely related to α -tocopherol and synthesized by certain methods developed in the course of earlier investigations on vitamin K-like substances (E. S. R., 86, p. 12) were tested for vitamin E activity. The results of these tests are summarized as follows:

"Neither pure α -tocopherylquinone nor 2,3,5-trimethyl-6-phytyl-1,4-benzoquinone exhibits any vitamin E activity at dose levels of 100 mg., notwithstanding the fact that both substances may be readily converted to α -tocopherol in the laboratory by acidic reducing agents. 2,3,5-Trimethyl-6-(β,γ -dihydrophytyl)-1,4-benzoquinone has no vitamin E activity at a dose of 25 mg. Naphthotocopherol, prepared from vitamin K₁, has moderate vitamin E activity."

Vitamin K, H. J. ALMQUIST. (Univ. Calif.). (*Physiol. Rev., 21 (1941), No. 1, pp. 194-216*).—This review considers the distribution of the vitamin in plants, micro-organisms, and animal tissues; the methods of determination; the physio-

logical relationships involved in diagnostic tests and the mechanism of vitamin K action, and in vitamin K function in various hemorrhagic diseases and tendencies; and the biochemistry of vitamin K as evolved by the works of various groups in purification, identification, and synthesis of the vitamin. There are 194 references listed.

Vitamin K (2-methyl-naphthoquinone (vitamin K-active), vitamin K₁), vitamin K₂, other related substances) (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+78*).—This bibliography, which supersedes the one noted previously (E. S. R., 85, p. 713), contains abstracts of papers which have appeared in the literature before May 1941 classified under the headings chemical investigation and description, physiological activity (in vitro, in experimental animals, and in man), occurrence, clinical uses (in the hemorrhagic diathesis of jaundice, in infants, miscellaneous, prothrombin estimation, and reviews), toxicity, and methods of assay (chemical and biological).

TEXTILES AND CLOTHING

"Particles" and their relationship to the structure of animal fibers, J. I. HARDY and T. M. PLITT. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 5, pp. 295-303, pl. 1*).—Minute structural units, termed "particles," were observed equally well in Lincoln and Karakul wool fibers subjected to disintegration by chemical means; reduction to a powder through digestion by carpet beetles, a new biological method; or grinding through a special mill and using only the resulting fine dust. Composed apparently of keratin, the particles are spherical, uniform in size, and measure approximately 0.6μ . They are doubly refractive to polarized light and many bear pigment. Individual particles have been isolated and photographed. The particles are aligned in chains, which constitute the fibrils. The chains lie parallel to the long axis of the fibers in the cortex, but appear to twist and interlock in the medulla.

A study of sampling in cross-section measurement of wool fiber, B. BAILEY. (S. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 7, pp. 407-415*).—The diameters and contours of wool fibers from the shoulder, middle, and thigh of fleeces of nine Notail sheep (E. S. R., 83, p. 756), and at the flesh, midpoint, and tip of the fibers were measured by the cross-section method. Analyses of variance, supplemented by other statistical tests, gave results suggesting that in studies of effects of environment and feed, consideration of variation throughout the length of the fiber is of importance. Since spinnability of wool is affected by contour and diameter and their variation among and within fibers, in conducting a wool-breeding program to produce a maximum of desirable fleece qualities, diameter and possibly contour should be measured at more than one point.

Shoe sizing and fitting: An analysis of practices and trends, C. W. MOFFETT (U. S. Dept. Agr., *Misc. Pub. 469 (1941), pp. [2]+31*).—This exploration of present practices and trends considers the background in which they originated, and discusses how last manufacturers arrive at size and fit and how shoe manufacturers influence and retailers interpret fit. It is pointed out that standardization of tools and methods has developed manufacturing capacity that now exceeds consumer demand, that tradition still influences attitudes toward sizing and fitting shoes, and that the shoe industry because of its complexity has made no concerted effort to deal with fitting problems raised by mass production. Scientific research on new methods of foot measurement adapted to the study of a large representative sample of people and capable of producing uniform results that can be analyzed statistically is necessary for the development of new size standards. Such measurements by an agency capable of serving all

groups in the industry, as well as consumers, and the cooperative efforts of all parties concerned are needed for successful development of national standards for sizing and fitting shoes.

HOME MANAGEMENT AND EQUIPMENT

Minimum requirements for farmhouses (*U. S. Dept. Agr., Misc. Pub. 475 (1941), pp. 8*).—"These minimum requirements for farm dwellings represent the judgment of Department of Agriculture agencies which have had first-hand experience with rural housing problems and have gained considerable knowledge of the kind of homes farm people want. They are based on conclusions reached after extensive study by technicians representing these agencies." Points considered include choosing a site, construction features contributing to comfort and livability, space requirements, storage space, kitchen storage, food storage, arrangement for privacy and convenience, light and ventilation, electric wiring, heating, fuel storage, water supply and sanitation, and health and safety.

MISCELLANEOUS

Agricultural research in New Hampshire: Annual report of the director of New Hampshire Agricultural Experiment Station for the year 1940, M. G. EASTMAN (*New Hampshire Sta. Bul. 330 (1941), pp. 42, fig. 1*).^o

Informe bienial años fiscales 1939 y 1940 [Biennial Report of the Puerto Rico University Station, 1939-40], J. A. B. NOLLA ET AL. (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. VIII+139, figs. 13*).—This report consists mainly of data previously noted from the annual reports (E. S. R., 83, p. 718; 86, p. 143), with some additional data noted for the most part elsewhere in this issue.

Fifty-fourth Annual Report [of Vermont Station, 1941], J. L. HILLS (*Vermont Sta. Bul. 475 (1941), pp. 40*).^o

Mississippi Farm Research, [September 1941] (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 9, pp. 8, figs. 6*).—In addition to articles noted elsewhere in this issue, there are included Adequate Rations, Comfortable Quarters, Exercise, Grazing Crops, Important in Management of Brood Sow and Litter, by P. G. Bedenbaugh (p. 2); Some Principles of Farm Woodland Management, by R. R. Reynolds (p. 6); and State Cotton Crop Smaller but of Better Quality, Longer Staple, by M. Guin (p. 7).

Bimonthly Bulletin, [September 1941] (*North Dakota Sta. Bimo. Bul., 4 (1941), No. 1, pp. 18, figs. 4*).—In addition to several articles noted elsewhere in this issue and the customary abstracts, this number contains Sunflowers and Coneflowers of North Dakota, by O. A. Stevens (pp. 11-13).

Deutsche Forschungsstätten im Dienste der Nahrungsfreiheit [German research in the service of food sufficiency], edited by H. PIEGLER (*Neudamm: J. Neumann, 1940, pp. 486, [pl. 1]*).—This is a classified list of about 1,300 German institutions carrying on research related to food production and utilization. Among the nine sections are those on agricultural and home management, soils and plants, forestry, animal husbandry, animal diseases, and the manufacture, nutritive value, and use of farm products. The history and scope of each institution is briefly described.

^o The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Illinois University and Station.—An Illinois Soybean Day in celebration of the completion of the first decade of the history of soybeans as an important farm crop in the State was held at the university on September 25, 1941. E. L. Hansen, assistant in agricultural engineering, has resigned to engage in commercial work and has been succeeded by Frank Andrews. Jean I. Simpson has been appointed associate professor and associate chief of home economics.

Massachusetts College and Station.—Fire caused by a spark from an electrical hoist ignited hay in the main storage barn on the college farm, resulting in damage estimated at over \$25,000.

George L. Farley, 4-H Club leader since 1916 and a pioneer in 4-H work in the Nation, died September 10, 1941, at the age of 68 years. During the quarter century of his service the club enrollment in the State rose from a few hundred to over 20,000 members.

Missouri Station.—Four new projects have been started which have a bearing on the national defense program. One of these deals with Missouri ticks and their control and aims to develop farm practices and other suppressive measures for reducing tick injury to livestock and man in the Ozarks. Special significance attaches to this project since Fort Leonard Wood is located in the area and Camp Crowder is under construction there.

Another project has to do with successful farming systems for small farms. The main object of this project is to determine the system of management on small farm units which seem to be yielding income to support acceptable levels of living for the farmer and his family. A large number of farm families are being displaced in connection with the defense program, and this project should be of material aid in working out a policy for resettlement.

The remaining projects have to do with nutrition of vegetables and their dietary value as influenced by soil treatments, and the vitamin potency of pork as influenced by the rations.

New York State Station.—Six months' leave of absence has been granted Dr. Robert S. Breed, head of the division of bacteriology. During this time he will undertake a field survey of dairy research and education in certain Central and South American countries for the Inter-American Committee for the Dairy Industry. A special study will be made of the status of public health activities relating to the handling of milk and other dairy products in the various countries, with visits to dairy research institutes, agricultural colleges and other agricultural centers, commercial dairy and dairy manufacturing plants, and dairy farm regions to gain first-hand knowledge of dairy practices and the dairy industry as a whole.

Ohio State University and Station.—Dr. C. W. Hauck, associate professor of rural economics and assistant in the station, has been granted a year's leave of absence effective October 1, 1941, to join the staff of the U. S. Office of Production Management. Recent additions to the station staff include Dr. Walter Krill as associate in animal industry and the following assistants: Dr. Alvin Wolfe, horticulture; Dr. J. B. Polivka, entomology; Dr. Raymond E. Cray, animal industry; and John Hibbs, dairy.

Oklahoma College and Station.—A department of home economics research has been established. This will be headed by Dr. Williamina A. Armstrong, instructor and assistant in home economics in the Illinois University and Station, who will take over nutrition research formerly handled by Dr. Gladys M. Kinsman, resigned to become a member of the Women's College, University of North Carolina. Home economics research has previously been administered under the department of agricultural chemistry. It is planned that the new department will assist with, and eventually expand, the textile research now being done by the department of agronomy in connection with the cotton quality work.

Drs. James A. Whatley, Jr., assistant professor of animal husbandry, and Lewis H. Moe, associate professor of bacteriology and veterinary medicine, have been called to active duty as reserve officers in the U. S. Army. Dr. Charles S. Hobbs has been appointed assistant professor of animal husbandry, and Dr. H. C. Smith assistant professor of veterinary medicine.

Tennessee Station.—Equipment of modern design for conducting experimental freezing and cold-storage tests on fruits, vegetables, and meats has been installed in the new agricultural engineering building. Varieties of each of the well-known and the newly developed kinds of fruits and vegetables grown in the State will be quick-frozen, held in cold storage for definite periods of time, and tested in various ways to determine their nearness to garden-fresh quality in taste, color, texture, and nutritional value. The methods developed are to be so standardized as to be reproducible both in the freezer-locker plants, of which there are already 27 in Tennessee, and the freezer-storage cabinet of the home.

Utah Station.—Herbert C. Folken has been appointed State representative of the U. S. D. A. Bureau of Agricultural Economics vice Dr. Dilworth Walker, resigned to become head of the department of economics and acting dean of the School of Business of the University of Utah. Max Beal has been appointed research assistant professor of agricultural marketing.

Virginia Station.—J. W. Weaver, Jr., has been appointed associate agricultural engineer effective October 1, 1941. John W. Sjogren, assistant agricultural engineer, has been transferred to full-time teaching duties. Other appointments include C. S. Coleman as assistant agronomist (soil survey) and Emanuel Azar as acting soils technologist vice H. T. Rogers, who is on educational leave.

West Virginia University and Station.—A number of new buildings were provided by the 1941 legislature, including a poultry building to cost \$15,000, a livestock judging pavilion \$12,500, a dairy barn \$8,500, a home demonstration practice house \$12,500, a hardening room for the creamery \$700, and a storage shed \$1,000. Grants were also made of \$5,000 for equipment, \$1,000 for repairs and improvements to farm buildings, \$8,500 for the purchase of a farm of 252 acres for animal husbandry work, and \$6,500 for additional land for dairy pasture. Low-income farm studies, including the sociological and economic phases, are to be begun, as well as additional research in foods and an expansion of wildlife studies. A new weekly release of station information has been started under the title *Epistle to Farm News*.

L. F. Miller has been appointed assistant agricultural economist.



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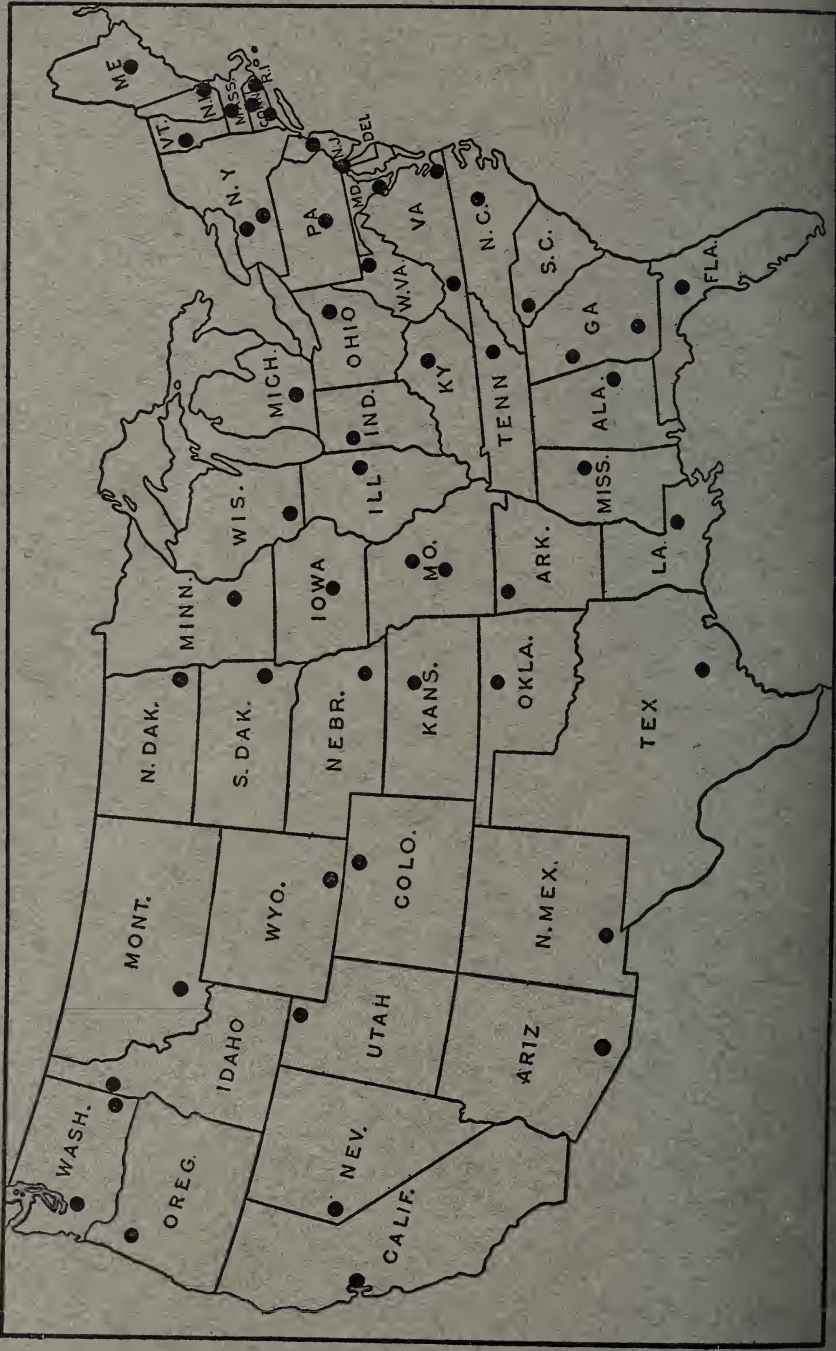
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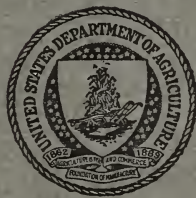
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EXPERIMENT STATION RECORD

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THE RETIREMENT OF DR. J. L. HILLS

The prospective retirement in June of Dean and Director Joseph L. Hills of Vermont will bring to a close one of the longest periods of active service in land-grant institutional history. The only dean of agriculture thus far to hold office at the University of Vermont, it is stated that he has personally conferred their degrees on all agricultural graduates of that university since its foundation except three. His connection with the State experiment stations began nearly 60 years ago, and aside from a 3-year interlude early in life for commercial work it has been continuous. Appointed director of the Vermont Station in 1893, he has long been the "dean of the corps" for the stations as a whole.

Dean Hills' influence, however, rests on a much more substantial basis than mere length of days. Not only has he grown up with the developments of over half a century in agricultural education and research, but he has been a militant and effective participant in these developments.

What may be termed the routine biographical details of his career are easily assembled. Although he was destined to become an authority on the agricultural needs and viewpoints of New England and to be the recipient in 1941 of the American Farm Bureau Federation's award for distinguished service to agriculture, he was born in the city of Boston. The date was March 2, 1861, substantially coincident with the inauguration of Abraham Lincoln and about a year before the passage of the Morrill Act and the establishment of the U. S. Department of Agriculture. He was graduated from the Massachusetts State College in 1881, and served the Massachusetts State Experiment Station as assistant chemist from 1882 to 1883 and the New Jersey Station in a similar capacity from 1884 to 1885. He began his work in Vermont in 1888 as chemist of the station, his appointment following the reorganization under the Hatch Act. Five years later he was also designated professor of agriculture and director of the station, and in 1898 he became dean of the newly organized College of Agriculture.

Dean Hills' service to Vermont has been one of personal accomplishment as well as leadership. The agricultural situation in that State has been unique. Funds have been limited, and opportunities

for spectacular expansion and large-scale operations have been few. Nevertheless growth has been consistent and substantial. Few deans anywhere have had a more direct influence upon their staffs and students. Few station directors have concerned themselves more intimately or more assiduously with the details of their stations' business, publications, and relationships.

A man of Dean Hills' characteristics is bound to be fully occupied with his appointed tasks, but he is also almost certain to be drafted when additional things need to be done. This has been his experience. Fundamentally, he has been interested and active in all that pertains to Vermont. Regionally, he has long been influential in the councils of the northeastern experiment station directors and in various groups of agricultural leaders of New England.

Nationally, some of his most useful service has been through the Association of Land-Grant Colleges and Universities. From 1904 to 1927 he was secretary-treasurer of this organization, and in 1928 its president. He is generally recognized as one of the best-informed of its membership as to its history and traditions. For this reason, as well as his Vermont associations, he was the logical selection at the celebration of the seventy-fifth anniversary of the Morrill Act to discuss Justin S. Morrill, the Statesman and the Man. His presidential address, entitled *The Builders of the Association*, consisted largely of personal recollections and tributes to Alvord of Maryland and Oklahoma, Atherton of Pennsylvania, Atwater of Connecticut, Goodell of Massachusetts, and White of Georgia.

At the time of writing it is not known to what field of activity he will devote himself upon his retirement. Beyond question he has richly earned a season of relaxation. Nevertheless it may well be that further biographical sketches, reminiscences, or other historical articles will be forthcoming. Few people have been so well equipped both by talents and associations to preserve for posterity a record of the happenings of the past as a guide and inspiration for the future. The one thing certain is that an official status of retirement will mean very little, and that to the extent of his time and strength he will continue to be very useful.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the New York State Station] (*New York State Sta. Rpt. 1941, pp. 21-23, 25, 26*).—These comprised work on maple products, including reduction of lead contamination from as much as 10 p. p. m. to a few tenths per million by clarification only, complete removal of lead by base-exchange material, production of a maple jelly, etc.; pectin studies in which calcium pectate formation was shown to be the cause of the firming effect of minute quantities of calcium chloride upon tomatoes and new information on the structure of pectins was obtained; grape maturity studies; determination of maturity of vegetables; and protein investigations, including general structure; effect of light on amino acids, proteins, and allied substances.

Carbohydrate characterization.—I, The oxidation of aldoses by hypoiodite in methanol; II, The identification of seven aldo-monosaccharides as benzimidazole derivatives, S. MOORE and K. P. LINK. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem., 133 (1940), No. 2, pp. 293-311*).—In the first of these two papers the authors describe an oxidation of aldoses to the corresponding aldonic acid by addition of the sugar in approximately 50 percent aqueous solution to a methanol solution of iodine and the further addition of potassium hydroxide to form the hypoiodite which constitutes the oxidant. Glucose, arabinose, and galactose yielded potassium salts which crystallize out of the reaction mixture. Mannose, xylose, rhamnose, and lyxose yielded highly soluble potassium salts of the aldonic acids, but these could be precipitated as amorphous barium salts by adding barium iodide. The percentage yields were very good.

In the second paper the preparation of 2-(aldopolyhydroxyalkyl)benzimidazoles by condensation of the aldones with *o*-phenylenediamine is described. These benzimidazoles were found to be stable white crystalline solids, with sharp melting points and with general chemical properties which make them specially suitable for identification work. Their preparation and isolation are simple and rapid. They can be prepared in from 50 to 80 percent yields by heating the aldonic acid with *o*-phenylenediamine, preferably in the presence of acid catalysts. The condensation is best carried out in most cases at an oil-bath temperature of 135° [C.] with the use of hydrochloric and phosphoric acids. (Xyonic acid requires a temperature of 180° in the presence of zinc chloride.) In the isolation of the derivatives, advantage is taken of their slight solubility in water and dilute ammonium hydroxide, high solubility in aqueous hydrochloric acid, and insolubility in acetone and ether. Aqueous acid is also conveniently employed as the solvent in determining the specific rotations. In contrast to the behavior of many of the derivatives of carbohydrates, the benzimidazoles crystallize readily. Individual derivatives may be separated by fractional crystallization. Practical examples are the rapid identification of glucose and arabinose in the same sample, or mannose, galactose, and glucose occurring simultaneously.

Synthesis of esters of phosphoric acid related to phosphatides, H. N. CHRISTENSEN (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 399-401).—The syntheses of aminoethylphosphoric acid by the action of ethylenimine on phosphoric acid, and of cetylphosphoric acid, chloroethylcetylphosphoric acid, and aminoethylcetylphosphoric acid are described. The last-named compound was prepared as an analog of natural cephalins.

The preparation and properties of pituitary follicle-stimulating fractions made by trypsin digestion, W. H. McSHAN and R. K. MEYER. (Univ. Wis.). (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 473-482).—A method is given for making follicle-stimulating preparations from aqueous extracts of sheep pituitary powder by digestion with trypsin. The trypsin is removed from the digested extracts by heat treatment, and further purification is effected by dialysis. Luteinizing as well as lactogenic and thyrotropic activities are destroyed. The product was found to be rich in carbohydrate, stable at 100° [C.] in the dry form, but inactivated in solution by ptyalin, takadiastase, and cysteine. The results are discussed in relation to the nature of the follicle-stimulating hormone.

The effects of high pressure on the activity of pepsin and rennin, J. E. MATTHEWS, JR., R. B. DOW, and A. K. ANDERSON. (Pa. State Col.). (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 697-705, figs. 5).—Activity decreased with pressure increase at constant exposure time and was completely destroyed at pressures ranging between 5,000 and 6,000 kg. per square centimeter. Activity decreased also with increase of exposure time at constant pressure, but to a lesser degree. Loss of activity appeared to be influenced by certain buffers, by the pH, and strongly by the temperature. It was shown that denaturation by pressure is the probable cause for inactivation, although the reaction is not a simple monomolecular one. Pressure treatments as high as 10,000 kg. per square centimeter caused no change in amino nitrogen content, and it was concluded that no hydrolysis was caused by pressure. The product of denaturation by pressure appeared similar to that of denaturation by heat. It was shown that the energy relations must be quite different in the two processes.

The activation of dipeptidases, J. BERGER and M. J. JOHNSON. (Univ. Wis.). (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 639-640).—In the course of attempts to isolate a yeast dipeptidase, it was found that a combination of metal and reducing agent was required as an activator. Metal or reducing agent alone may cause a substantial activation, but a combination of the two is usually far superior. For the yeast dipeptidase Mn^{++} or F^{++} may serve as the metal, and cysteine, glutathione, or thioglycolic acid may serve as the reducing agent. Mn^{++} -cysteine has been the most reliable combination. Dipeptidases from other sources were found to be similarly activated.

Chlorophyllase, C. A. WEAST and G. MACKINNEY. (Univ. Calif.). (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 551-558).—The authors report experiments showing that this enzyme varies markedly in the conditions and intensity of its activity from one plant to another. Chlorophyll may be enzymatically hydrolyzed in three solvents, for which optimal conditions in a period varying from some minutes to 24 hr. are as follows: Ethanol, 80 percent, 25° [C.]; acetone, from 40 to 70 percent, 25°; water 75°. Virtually no activity is found with wild oats; spinach shows at times high activity in water, but little in acetone or alcohol; figwort shows extremely high activity in alcohol, but none in water; and numerous other plants investigated show intermediate activities. The enzyme is difficult to extract, and best results with enzyme meal indicate at least a 50-percent reduction in activity. Numerous further observations are recorded.

Experiments on the burn of cigars, J. JOHNSON (*Wisconsin Sta. Res. Bul. 140 (1941), pp. [2]+25, figs. 9*).—Leaf burn was tested by a method essentially that previously used at the Connecticut State Station (E. S. R. 59, p. 733). Cigar burn was determined both by machine- and natural-smoking tests.

To obtain a satisfactory cigar burn when the filler, binder, and wrapper are all from the same lot of tobacco (unblended cigars), a leaf burn of 20 sec. or more is usually necessary. A leaf burn of 20 sec. is near the minimum that may be satisfactorily used as a cigar wrapper, but the burning quality of the wrapper may depend more upon a rapid rate of burn and upon a low-temperature requirement for ignition than upon the leaf-burn measurement. A filler leaf of average leaf burn as low as 10 sec. may yield a good cigar burn when supported by a binder leaf of 10 sec. or more and a wrapper leaf of 30 sec. or more. A small percentage of very low-burning filler (0-2 sec.) may not seriously affect cigar burn, but such poor burning leaf may be tolerated only in the filler. A binder with a leaf burn as low as 5 sec. will yield a satisfactory cigar burn when the filler and the wrapper are of 20 sec. or more. A binder leaf burn below 3 sec. may be ruinous to the burn of a cigar even though the filler and the wrapper are of high burning quality. The range between favorable and unfavorable leaf burn is, therefore, often relatively small.

As at the Connecticut State Station (E. S. R., 61, p. 134), the fertilizer treatment affected the burning quality of the tobacco. The fertilizer treatment of the soil also influenced the cigar burn apart from any effect on the leaf burn. The value of treatment of leaf tobacco with potassium salts for the purpose of improving the burn appeared to be limited to some types of poor-burning leaf, and its practical adaptability is doubtful.

Leaf-burn tests were made on 45 brands of commercial cigars, and smoking tests were made on 10 brands. The average leaf burn was found to be 32 sec. In some individual cigars and in some brands, it was below the required minimum for satisfactory cigar burn, however. These exceptions, together with improper compactness of the filler and excessive moisture in manufacturing, are believed to account for most of the poor-burning cigars which reach the retail market. It is essential to satisfactory cigar burn that the leaf burn used in each part of the cigar be up to a required minimum, but this minimum was found to be considerably lower than anticipated, and the benefits from increased leaf burn beyond this point diminish rapidly. The results on the whole suggest that more accurate determinations of the leaf burn of filler and binder leaf in particular may be advantageous both to manufacturers and to growers.

[**Reports of referees and associate referees on analytical methods**] (*Jour. Assoc. Off. Agr. Chem., 24 (1941), No. 3, pp. 517-727, figs. 9*).—The following reports were contributed from the State and Federal institutions respectively noted, from State control and regulatory laboratories, etc.: Plants, by E. J. Miller (pp. 517-518) (Mich. Expt. Sta.); iodine and boron, by J. S. McHargue and W. S. Hodgkiss (pp. 518-520) (Ky. Sta.); zinc in plants, by H. Cowling (pp. 520-526), and chlorophyll and carotene in plant tissue (pp. 526-539) (both Mich. Sta.); enzymes (papain), by R. F. Thompson (p. 540) (Hawaii Sta.); water, brine, and salt (fluorine in water), by A. E. Mix (pp. 540-544); dairy products, by G. G. Frary (p. 544); butter, by J. A. Mathews (pp. 544-545); casein in malted milk, by I. Schurman (pp. 545-547); dried milk, by F. Hillig (pp. 548-550); mold in butter, by J. D. Wildman and E. W. Coulter (pp. 550-556); neutralizers in dairy products, by F. Hillig (pp. 556-559); tests for pasteurization of dairy products, by F. W. Gilcreas (pp. 559-574); frozen

desserts, by F. L. Hart (pp. 575-577); radioactivity, by A. Wold (pp. 578-581); cereals, by V. E. Munsey (pp. 581-583); H-ion concentration of cereal products, by G. Garnatz (pp. 583-586); fat acidity in grain, by L. Zeleny (pp. 587-590) (U. S. D. A.); baking test for soft wheat flours, by E. G. Bayfield (pp. 590-611) (U. S. D. A. coop. Ohio Sta.); flour-bleaching chemicals, by D. B. Scott (pp. 611-613); milk solids in milk bread—butterfat in milk bread, by V. E. Munsey (pp. 613-615); proteolytic enzymes, by Q. Landis (pp. 615-617); whole-wheat flour, by C. S. Ladd (pp. 617-619); sterols, by E. O. Haenni (pp. 620-621); barley and rice products, by A. D. Dickson (pp. 622-624) (U. S. D. A.); baked products other than bread, by S. S. Voris (pp. 624-627); moisture in self-rising and pancake flours, etc., by L. H. Bailey (p. 628) (U. S. D. A.); standard solutions, by R. L. Vandaveer (pp. 628-631); silver nitrate and thiocyanate standard solutions, by E. C. Deal (pp. 631-635); standardization of sulfuric acid, by H. W. Conroy (pp. 636-639); standard solutions of iodine and arsenite, by G. M. Johnson (pp. 639-641); microchemical methods—Kjeldahl nitrogen method, by E. P. Clark (pp. 641-647), the micro- and semimicro-Kjeldahl nitrogen method, by F. Acree, Jr. (pp. 648-651), insecticides, fungicides, and caustic poisons (pyrethrum, derris, and cube), by J. J. T. Graham (pp. 651-653), and fluorine compounds, by C. G. Donovan (pp. 653-654) (all U. S. D. A.); sugars and sugar products, by R. F. Jackson (p. 654); acetylmethylcarbinol and diacetyl in food products, by J. B. Wilson (pp. 655-656); unfermented reducing substances in molasses, by F. W. Zerban (pp. 656-662); flavors and nonalcoholic beverages, by J. B. Wilson (pp. 663-665); meat and meat products, by R. H. Kerr (pp. 665-667) (U. S. D. A.); spices and condiments, by S. Alfend (pp. 667-682); vinegars, by A. M. Henry (pp. 682-683); phosphoric acid in vinegar, by J. W. Sanders, Jr., and A. M. Henry (pp. 684-690); detection of caramel in vinegar, by H. M. Gulick (pp. 691-695); salad dressings, by L. T. Ryan (pp. 695-700); mustard and mustard products, by J. T. Field (pp. 700-705); fish and other marine products, by H. D. Grigsby (pp. 705-706); fat and moisture in fish, by M. Tubis (pp. 706-712); cacao products, by W. O. Winkler (pp. 712-715); milk proteins in milk chocolate, by M. L. Offutt (pp. 715-720); chocolate in sweet chocolate and milk chocolate, by W. O. Winkler (pp. 720-721); gums in foods, by F. L. Hart (pp. 721-722); oils, fats, and waxes, by J. Fitelson (pp. 722-724); microbiological methods, by A. C. Hunter (pp. 725-726); and microbiological methods for the examination of canned fruits, tomatoes, and other acid foods, by B. A. Linden (pp. 726-727).

A photoelectric method for the microdetermination of potassium in blood plasma by the chloroplatinate precipitation, R. M. TENERY and C. E. ANDERSON (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 659-669, figs. 3).—The authors describe a procedure which adapts the chloroplatinic acid precipitation method for potassium to 0.3-cc. samples of plasma, the final reading being based upon the photoelectric determination of potassium iodoplatinate with a correction made from known standards carried through the procedure with the unknown solution.

An improved method for the determination of non-hemin iron, G. BRÜCKMANN and S. G. ZONDEK (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 23-30).—Extraction of all the nonhemin (but none of the hemin) iron is accomplished by heating 1 gm. of the ground tissue at 100° [C.] for 7 min. with 5 cc. of saturated sodium pyrophosphate and 10 cc. of 10 percent trichloroacetic acid, and twice washing the residue, separated by centrifuging, with 4 cc. of a mixture of equal parts of the two reagents. Iron in the extract is determined by the thioglycolic acid or the *o*-phenanthroline method. This rapid procedure

results in as complete extraction of the iron as is effected by the reagents acting on the tissue in the cold for 4 days. Values obtained for nonhemin iron by these two extraction procedures check well with each other and with the calculated difference between determined values for total and hemin iron. Recovery of added iron is satisfactory.

Determination of serum iron and pseudohemoglobin iron with o-phenanthroline. G. BARKAN and B. S. WALKER (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 37-42).—"A method for the measurement of the total iron in serum or plasma, or of the pseudohemoglobin iron of whole blood, is described. It involves incubation with dilute hydrochloric acid, reduction of the iron to the ferrous state with hydrazine, and the measurement in a photoelectric colorimeter of the ferrous complex of o-phenanthroline."

Photoelectric microdetermination of calcium in serum. J. SENDROY, JR. (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 136-138).—"The procedure, outlined in detail, determines calcium by direct precipitation in samples of 0.2 cc. or less of serum. The calcium is precipitated as the oxalate, which is filtered off (after the addition of Triton N E to lower the surface tension and prevent creeping), dissolved in dilute H_2SO_4 , and oxidized with 0.0018 N $Ce(SO_4)_2$. The excess of this reagent is determined by reaction with KI in the presence of a starch indicator, and the depth of blue color due to liberated iodine is determined colorimetrically with the Evelyn colorimeter. The results, together with those from two controls representing 12.5 and 25 microequivalents of oxalate per liter, are plotted on semilogarithmic paper with abscissa units of microequivalents of oxalate per liter and ordinate units of galvanometer readings. A straight line is drawn through the readings of the two controls, and the oxalate values of the serum samples are found by interpolation. The average deviation of the micro (0.2 cc.) colorimetric results from the macro (1 cc.) gasometric values was found to be ± 1.5 percent, with extreme limits of -3.6 and $+2.8$ percent.

Micro-determination of copper in biological material. A. EDEN and H. H. GREEN (*Biochem. Jour.*, 34 (1940), No. 8-9, pp. 1202-1208).—"The diethyldithiocarbamate method for estimation of Cu in biological material is improved in simplicity, speed, accuracy, and sensitivity. Rapid wet digestion, with a combination of sulfuric, perchloric, and nitric acids in 8 by 1 in. pyrex test tubes, is employed for destruction of organic matter, followed by deionization of iron with citrate or pyrophosphate in strongly alkaline medium. Subsequent color formation and extraction with amyl alcohol are effected in the combustion tube itself. With quantities such as 5 cc. blood containing 3 $\mu g.$ Cu the final reading is either colorimetric or photometric, but with limited material from small laboratory animals, involving determination of real amounts of Cu as low as 0.3 $\mu g.$, photometric finish with a low wavelength light filter is essential. About 30 determinations per day can be completed by a single analyst."

A photometric method for the determination of magnesium. W. S. GILLAM. (Mich. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 499-501, figs. 2).—"A rapid and reliable method of analysis for small quantities of magnesium is based on the reaction of an alkaline solution containing magnesium ions with titan yellow to produce a pink or red color. This can readily be matched with standards or measured in a photoelectric colorimeter. Hydroxylamine hydrochloride was used as a stabilizer. The method was shown to be applicable for the determination of magnesium in quantities ranging from 0.5 to 300 p. p. m., and calcium, up to a maximum concentration of 800 p. p. m., did not interfere.

Results from the analysis of several commercial fertilizers, tap water, and soil extracts are given, together with a comparison of results obtained by this method and by the hydroxyquinolate gravimetric method.

The determination of replaceable magnesium in soils, using 8-hydroxyquinoline, A. J. METSON (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 3B, pp. 125B-135B).—The 8-hydroxyquinoline method was applied to the determination of the replaceable magnesium in soils by the ammonium acetate procedure.

Determination of pH value for alkali soils, W. T. McGEORGE and W. P. MARTIN. (Ariz. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 2, pp. 234-244).—A continuation of work previously reported on pH value of alkali soils (E. S. R., 84, p. 582). Nine soil samples collected from widely separated sections of the West were analyzed by 10 collaborators in an attempt to determine variation and also improve analytical procedure. The glass electrode was used for all determinations, and each instrument was standardized against a buffer or one of the soil samples. One series of determinations was made at a low moisture content and another at a 1:5 soil-water ratio. The results of the different analysts were comparatively uniform, and pH values obtained on the soils at field moisture content were less variable than those obtained for the 1:5 soil-water ratio, the average standard deviations of the data being 0.11 and 0.14 pH units, respectively. A comparison of the methods of wetting the soil showed that mixing soil in a 50-cc. beaker was preferable. The results again indicated that pH determinations should be made on semiarid soils when at a low moisture content. The results of statistical analysis of the data are summarized.

Analyses of urinary protein and various fractions of human and pig serum protein, W. A. MURRILL, W. D. BLOCK, and L. H. NEWBURGH (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 521-527).—A comparative study of the composition of serum albumin, serum globulin, and urinary protein has been made by determining the sulfur, nitrogen, and various amino acids. The results indicate that urinary protein is either all serum albumin or is a mixture correctly represented by the albumin:globulin ratio as found in the urine. Two samples of urinary protein collected while the subject subsisted on different diets showed identical analyses. When pig serum was fractionated and the various fractions were analyzed no evidence was obtained to indicate that the various fractions differed widely in composition.

Removal of the impurities, nucleic acid and polysaccharide, from tuberculin protein, F. B. SEIBERT (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 593-604, figs. 2).—Tuberculin potency determined by the skin reaction was dependent upon tuberculin protein only. By means of repeated electrophoresis at pH 7.3, it was possible to remove both nucleic acid and polysaccharide from the protein with no loss in potency. It was also possible to remove both of these impurities from the protein by repeated precipitation on the alkaline side of pH 5.0, as by half saturation with ammonium sulfate at pH 7.0, with no loss in potency.

Aromatic sulfonic acids as reagents for amino acids, D. G. DOHERTY, W. H. STEIN, and M. BERGMANN (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 487-496).—The solubility products of salts of a number of aromatic sulfonic acids with various amino acids are reported. Of the 26 sulfonic acids listed, 25 form sparingly soluble salts with phenylalanine, 22 with leucine, 17 with histidine, 14 with arginine, 13 with tyrosine, and only 3 with lysine. The monoamino acids phenylalanine and leucine form sparingly soluble salts with more sulfonic acids than do the basic amino acids. Histidine is precipitated by many more sulfonic acids than is the stronger base lysine. The solubilities of the corresponding

leucine and isoleucine salts exhibit great differences. In all the cases reported the leucine salts are far less soluble. Only a few isoleucine salts were found to be of sufficiently low solubility to warrant inclusion. The tyrosine salt of flavianic acid is particularly insoluble and is being employed for the determination of tyrosine in protein hydrolyzates low in arginine. The salts of 5-nitro-naphthalene-1-sulfonic acid with glycine and with hydroxyproline are sufficiently insoluble to be employed in determinations of these amino acids. The leucine salts of 2-bromotoluene-5-sulfonic acid and 2-naphthol-7-sulfonic acid are less soluble than are the phenylalanine salts. These reagents have been employed for the determination of leucine in protein hydrolyzates. 2,5-Dibromobenzenesulfonic acid and 2,4,5-trichlorobenzenesulfonic acid may be of use in the determination of phenylalanine in protein hydrolyzates. The phenylalanine salts of these compounds are so much less soluble than are the leucine, arginine, and histidine salts that determinations of phenylalanine are possible even in the presence of an excess of these three amino acids.

Elimination of acetoacetic acid in the determination of pyruvic acid by Lu's method, S. ELGART and N. NELSON (*Jour. Biol. Chem.*, 138 (1941), No. 1, pp. 443-444).—Details are given for the procedure, which involves precipitation of the blood, stabilized with sodium iodoacetate, with tungstic acid. The filtrate is heated in the boiling water bath for 1 hr. with concentrated HCl, which is then just neutralized with 40 percent NaOH. After cooling, the 2,4-dinitrophenylhydrazine reagent is added and the method of Lü (*E. S. R.*, 82, p. 587) followed thereafter.

Cereal laboratory methods with reference tables, C. E. MANGELS ET AL. (*Lincoln, Nebr.: Amer. Assoc. Cereal Chem.*, 1941, 4. ed., rev., pp. XII+264, [pls. 5], figs. [13]).—The present edition (*E. S. R.*, 75, p. 302) brings up to date the material previously published, and presents new chapters on experimental milling, malt, rye, and experimental macaroni processing. The appendix has also been expanded to include a section on elementary statistical principles as applied to cereal chemical data, a section on the preparation and standardization of solutions, a glossary of cereal chemical terms, and various reference tables to accompany new sections in the main portion of the book. Tables previously given for the correction of ash and protein to a 15-percent moisture basis have been replaced by four charts showing corrections for both 13.5- and 15-percent moisture bases. Included in the chapter on flour and semolina are methods for the determination of thiamin, riboflavin, and iron.

The estimation of lactose in milk, A. K. R. McDOWELL (*Jour. Dairy Res. [London]*, 12 (1941), No. 2, pp. 131-133).—Based on a comparison of several methods for the estimation of lactose in milk, it is concluded that the direct volumetric copper reduction method applied to unclarified milk gives results in good agreement with those on the same milk clarified and decalcified. For the polarimetric or iodometric methods of estimation it is desirable to clarify the milk with zinc or cadmium hydroxide. Dialyzed iron, phosphotungstic acid, cadmium hydroxide, or zinc hydroxide are all suitable for deproteinizing the milk for the chloramine-T method of estimation of lactose. The values for lactose content of milk as estimated by the above methods show good agreement and, therefore, may be accepted as the true milk sugar content.

Determination of pure carotene in green vegetables and green feeds, G. S. FRAPS, W. W. MEINKE, and A. R. KEMMERER. (*Tex. Expt. Sta.*). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 3, pp. 739-744).—Carotene was determined in green and yellow vegetables, dried apricots, and grass and clover in samples prepared for analysis by grinding them (1) while raw, (2) after cooking, and (3) while raw but covered with alcohol. The fresh samples after grinding

contained from 63 to 127 percent and the cooked samples from 37 to 132 percent of the carotene contained in the alcohol-treated samples. In sweetpotatoes, Bermuda grass, two of the three samples of carrots, and two of the five samples of spinach, the carotene content, determined on the cooked material, was less than that in material ground while uncooked. To inhibit these carotene losses in the preparation of green vegetables and feeds for analysis, a method is proposed whereby they are ground under 95 percent ethyl alcohol and filtered through cheesecloth, aliquots of both the solid and the liquid portions equivalent to 5 gm. of the fresh untreated material being mixed together for analysis. The sample is saponified by boiling for 30 min. in 12 percent alcoholic KOH; after cooling the mixture is extracted with petroleum benzene, the extraction of the residue being repeated until no further color is removed. Since alkaline treatment was found to inhibit carotene extraction in sweetpotatoes, it is proposed to modify the procedure by boiling them 30 min. with 95 percent ethanol instead of alcoholic KOH, the latter treatment being considered dispensable since no detectable amounts of xanthophyl or xanthophyl esters were found in sweetpotatoes.

Relation of chemical analyses of butter to its vitamin A potency, G. S. FRAPS, A. R. KEMMERER, and W. W. MEINKE. (Tex. Expt. Sta.). (Jour. Assoc. Off. Agr. Chem., 24 (1941), No. 3, pp. 731-735).—Twenty-nine samples of butterfat were analyzed for spectro vitamin A by the method of Fraps et al. (E. S. R., 79, p. 100) and for carotene by a spectrophotometric method involving factorial conversion of readings of color density, at 470 and 480 $m\mu$, of a petroleum benzene solution of butter. Vitamin A potency of the butterfats was estimated by the U. S. P. method, modified to use standards of pure carotene in Wesson oil instead of the U. S. P. reference oil. It was found that the biological potency in International Units could be calculated from the analyses by the equation $IU = S3.2 + 1.7C$ or $IU = (S - 0.5)4 + 1.7C$, where S equals the spectro vitamin A in parts per million and C the carotene in parts per million. The second equation gave the better results. "With 23 of the 29 samples of butter analyzed, the International Units per gram calculated by the second equation differed from the number of International Units found by 4 units or less. Five of the samples differed by 5 to 8 units and one by 22 units."

A procedure for the decolorization of acid digestion mixtures for the determination of nicotinic acid, T. E. FRIEDEMANN and C. J. BARBORKA (Jour. Biol. Chem., 138 (1941), No. 2, pp. 785-786).—A procedure is described in detail for obtaining clear, almost colorless solutions from acid digestion mixtures of whole blood, dried blood, urine, and tissues. The method involves digestion of the material by a period of boiling with 8 N HCl on the water bath. After cooling the colored material is precipitated in the digestion tube with zinc hydroxide formed in the tube by the interaction of zinc sulfate and sodium hydroxide solutions. After complete cooling and a brief period of standing, the precipitate is separated from the solution by centrifugation. The method possesses simplicity and permits the complete recovery of added nicotinic acid.

A note on an assay method for pantothenic acid in human blood, S. R. STANBERY, E. E. SNELL, and T. D. SPIES (Jour. Biol. Chem., 135 (1940), No. 1, pp. 353-354).—The bacteriological method of Pennington et al. (E. S. R., 85, p. 442) as adapted for application to blood involves the use of 1 cc. of citrated venous blood which is laked with 9 cc. of water. The resulting solution is added to tubes of medium in duplicate concentrations ranging from 0.1 to 0.3 cc. of original blood, the tubes then being plugged and autoclaved at 15 lb. pressure for 15 min. to precipitate blood protein, after which they are inoculated and incubated for 72 hr. The acid produced is titrated, and the amount of pantothenic acid formed is read from the standard curve. The variation between

duplicate concentrations of the same blood is not more than 0.05–0.1 cc. of alkali; agreement of values at different dosage levels indicates that the test is specific for pantothenic acid when blood concentration is not above 0.3 cc.; the recoveries of added pantothenic acid are 95–100 percent (although less if higher concentration is used); and the addition of pantothenic acid-free blood filtrate to the basal medium does not increase the specificity or accuracy of the test.

The pantothenic acid content of the blood of 18 normal persons varied from 0.19 γ to 0.32 γ per cubic centimeter, averaging 0.225 γ , while the blood of 28 patients with pellagra, beriberi, and riboflavin deficiency showed values from 0.05 γ to 0.09 γ below the normal average. Successive blood samples from the same person varied by less than 0.02 γ per cubic centimeter, and autolysis of the blood did not liberate additional pantothenic acid.

A proposed modification of Emmerie's iron-dipyridyl method for determining the tocopherol content of oils, W. E. PARKER and W. D. MCFARLANE (*Canad. Jour. Res.*, 18 (1940), No. 12, Sect. B, pp. 405–409).—The modification described is designed to remove carotenoids and other interfering substances and consists of treating a petroleum ether solution of the wheat-germ oil with 85 percent H₂SO₄, centrifuging, and washing the supernatant petroleum ether with dilute alkali.

The chemistry of vitamin E, L. I. SMITH. (Univ. Minn.). (*Chem. Rev.*, 27 (1940), No. 2, pp. 287–329, figs. 4).—An extensive review in which the following topics are considered: α -, β -, and γ -tocopherols; chemical properties of the tocopherols; methods of assay and analysis for tocopherols; specificity of vitamin E; uses and importance of vitamin E; and vitamin K. One hundred and forty references are cited.

The production of ethyl alcohol from cull potatoes and other farm crops, H. BERESFORD and L. M. CHRISTENSEN (*Idaho Sta. Bul.* 241 (1941), pp. 28, figs. 4).—The first three sections present brief reviews of recent publications pertaining to present or potential markets for ethyl alcohol and to current processing methods and byproducts. Research leading to the development of an improved manufacturing process of mashing and saccharification is briefly described, and a record of the operations of the experimental plant at Idaho Falls is presented, following which cost statements are given. Credits being allowed for the sale of byproduct feed and of carbon dioxide in the form of dry ice, the minimum estimated cost of producing anhydrous, undenatured alcohol from cull potatoes is less than 11 ct. per gallon, the maximum estimate nearly 21 ct. Corresponding figures for alcohol produced from grain sorghum are 12.79 ct. minimum and 14.69 ct. maximum. These figures are based upon the assumption of capacity operation during 330 days per year.

Cottonseed protein for plastic molding (*Miss. Farm Res.* [Mississippi Sta.], 4 (1941), No. 11, p. 5).—Uses of a cottonseed protein preparation adapted to industrial applications are said to include the manufacture of a plastic, considerably improved by an admixture of from 30 to 40 percent of a phenol-formaldehyde resin; plywood glue; etc. Work on the Ca and P composition of turnip greens is also mentioned.

AGRICULTURAL METEOROLOGY

[Reports and papers, section of meteorology] (*Amer. Geophys. Union Trans.*, 22 (1941), pt. 2, pp. 419–437b, figs. 16).—The following are of interest: Meteorology in the 1941 Yearbook of Agriculture, by G. Hambidge (pp. 419–420) (U. S. D. A.); Atmospheric-Pressure Waves Near Pasadena, by B. Gutenberg and H. Benioff (pp. 424–426); Apparent Rate of Progress as Affected by Chang-

ing Intensity of Hurricane San Felipe (II) While Crossing Puerto Rico, by C. F. Brooks (pp. 426-428); Foreshadowing Montana's Winter Precipitation (Verification), by I. I. Schell (pp. 428-429); The Chemical Absorption Hygrometer as a Meteorological Instrument, by C. W. Thornthwaite (pp. 429-432) (U. S. D. A.); Errors in Measurements of Condensation-Nuclei, by O. H. Gish and M. L. Phillips (pp. 432-434); and Comments on the Weather Bureau's Experiment in Five-Day Weather-Forecasting, by C. G. Rossby (pp. 437-437b).

[Papers on hydrology] (*Amer. Geophys. Union Trans.*, 22 (1941), pt. 1, pp. 106-207, figs. 44).—The following are of interest to meteorology: Potential Floods in the Sacramento Valley, by W. J. Parsons, Jr. (pp. 106-110); Storm Characteristics of the Sacramento Basin, by J. B. Paulson, Jr. (pp. 111-117); California Cooperative Snow-Surveys—Results of 1940 Forecasts, by F. Paget (p. 138); Summary of 1940 Forecast for Owens River Drainage-Basin, by J. E. Jones (p. 139); Summary of 1940 Forecast for Huntington, Florence, and Shaver Lakes, by W. A. Lang (pp. 139-140); Runoff From Melting Snow on the Moku-lumne Watershed, 1940, by L. S. Hall (pp. 140-141); Nevada Cooperative Snow-Surveys—Eastern Slope, Central Sierra Nevada—Comparison of Forecast and Actual Results, 1940, by H. P. Boardman, G. G. Devore, and L. Sanford (pp. 141-142); Review of the 1940 Forecasts of Runoff for Eastern Nevada, by C. Elges (p. 143) (Nev. Expt. Sta.); Experience with Irrigation-Water Forecasting in Upper Columbia Drainage-Basin During 1940, by J. C. Marr (pp. 143-144) (U. S. D. A.); Report on Snow-Surveys and Actual Conditions in the Columbia, Kootenay, and Okanagan Basins, and the Coastal Belt Adjacent to Vancouver for 1940, by S. H. Frame (pp. 144-146); Correlation of Stream-Flow and Snow-Cover in Colorado, by R. L. Parshall (pp. 153-159) (U. S. D. A.); Type Curves and Variability of Annual Snowfall—State of Washington, by P. E. Church (pp. 159-170); The Use of Snow-Survey Predictions in the Operation of Combined Flood-Control and Conservation Reservoirs for Regulation of Snow-Melt Runoff, by A. C. Showman (pp. 170-173); Soil-Freezing and Forest-Cover, by K. T. Belotelkin (pp. 173-175); Progress Toward a Rational Program of Snow-Melt Forecasting, by M. Bernard (pp. 176-178); a New Technique for the Determination of Heat Necessary To Melt Snow, by M. Bernard and W. T. Wilson (pp. 178-181); An Outline of the Thermodynamics of Snow-Melt, by W. T. Wilson (pp. 182-195); Analysis of High Rates of Snow-Melting, by P. Light (pp. 195-205); and Forecasting the Date of the Decline of the Carson Rivers on the Basis of the Seasonal Percentage of the Contributing Snow-Cover, by P. Krummes (pp. 205-206).

Hydrologic data: North Appalachian Experimental Watershed, Coshoc-ton, Ohio, 1939. (Coop. Ohio Expt. Sta. et al.). (*U. S. Dept. Agr., Soil Conserv. Serv., Hydrol. Bul. 1* (1941), pp. IV+193, pls. 4, figs. 15).—The data presented are being collected primarily to determine the effect of agricultural land use practices on the conservation of soil and water and on floods. They are also needed for economically designing the erosion, flood-control, and hydraulic structures used in the general soil- and water-conservation program. In addition to the introductory, descriptive, and graphical data relative to the project, the bulletin presents for 1939 miscellaneous meteorological information on the area; data on soil moisture; monthly rainfall, run-off, and percolation data on the in situ lysimeters; pertinent physical data relating to the several watersheds; a summary of rain-fall, run-off, and silt loss for each watershed; daily run-off amounts for the larger watersheds (October 1, 1938, to December 31, 1939); details of the run-off from watersheds and from the lysimeters for selected storms; details of the time distribution of rainfall for

selected storms for 26 recording gages; and data on the location of ground-water wells, records of levels for which are shown.

The meteorology of great floods in the eastern United States, C. F. BROOKS and A. H. THIESSEN (*Smithsn. Inst. Ann. Rpt., 1938, pp. 325-348, pl. 1, figs. 13*). The authors discuss the causes and seasons of great floods, the Ohio-Mississippi flood of January-February 1937, western cold and accompaniment of eastern floods, similarities between the Ohio floods of 1913 and 1937, comparison with floods of 1922 and 1882, April and May floods in the Mississippi Valley, floods caused in part by orographic rainfall—Appalachian and north-eastern floods of March 1936, the Johnstown flood of 1889, the New England and New York floods of 1927, 1935, and 1938, and the southern Appalachian and southeastern floods of July 1916.

Method of predicting the runoff from rainfall, R. K. LINSLEY, JR., and W. C. ACKERMANN (*Amer. Soc. Civ. Engin. Proc., 67 (1941), No. 6, pp. 1023-1033, figs. 8*).—The authors have analyzed hydrological and meteorological records of the Valley River Basin (N. C.) to develop a "rational method of predicting run-off based on average rainfall and evaporation from a standard land pan." The methods of estimating run-off presented are said to represent a distinct refinement over rainfall run-off relations in which such third variables as initial flow, ground-water level, or days to the last rain are used as criteria. The average difference between measured and computed losses for the storms studied was only +0.01 in., whereas the standard error of estimate is 0.1 in., which represents rather satisfactory accuracy for this problem. Further study of a parallel nature is indicated to determine how these relations vary for other types of basins and for other seasons of the year.

Relation of annual ring formation to rainfall, as illustrated in six species of trees in Marshall County, Indiana, R. C. and G. M. FRIESNER (*Butler Univ. Bot. Studies, 5 (1941), Papers 1-8, pp. 95-112*).—Over the period 1900-1939, the highest percentage of correlation for most specimens was with rainfall for either June-August or the single month of June, but individual exceptions were noted in which the highest correlation was with other rainfall periods. When rainfall was conspicuously greater for one year (or part of a year) than for the preceding year growth was also greater in 50-72 percent of the years, but when rainfall for corresponding periods was conspicuously less than for the preceding year growth was also less in 62-82 percent of the years. When rainfall for one year (or a particular part) was conspicuously greater or less than for the preceding year growth was greater or less, respectively, in a large percentage of individual trees, but some years were found in which the percentage of individual trees with such a correlation was very small. This lack of correlation was due to the distribution of rainfall failing to coincide with the vegetative year. In years with 90-100 percent agreement among the individual trees, increase in growth was correlated with increase in rainfall and decrease with decrease in rainfall for nearly all month combinations. The correlation was perfect for June-August rainfall except for 1922, 1923, and 1931, during which years the rainfall for the month combinations August-July of the following year formed perfect correlation. There are 16 references.

Variations of atmospheric temperature with altitude in the United States, H. W. TENNEY (*Elect. Engin., 60 (1941), No. 5, pp. 230-231, 232, figs. 5*).—The author presents a summary of the variation of mean temperatures with altitude.

The annual march of temperature at Washington, D. C., G. SLOCUM (*Amer. Met. Soc. Bul., 22 (1941), No. 5, pp. 220-227, figs. 5*).—"A number of diagrams are shown, contrasting day-by-day average temperatures at Washington with

the accepted 'normals,' showing extreme highest and lowest temperatures for each day of the year, the 'January thaw,' a recurrent cold period in February, an estimation of the potentially highest and lowest temperatures at Washington, and recent abnormal temperature trends are discussed. The annual day-by-day march of degree days for heating is also noted. The results in general suggest some revision of the popular conception of 'normals' is in order."

Meteorological records, 1883 to 1940, inclusive (*New York State Sta. Rpt. 1941, pp. 73-84*).—Tabulations are presented of monthly and yearly maximum and minimum temperatures and monthly and yearly means of temperatures, 1883-1940; precipitation by rainfall only, 1882-1917; and total precipitation (rainfall plus snow reduced to equivalent rainfall), 1918-1940.

Agricultural meteorology: Summer sequence of monthly mean temperature at Winnipeg, Swift Current, and Edmonton, J. W. HOPKINS (*Canad. Jour. Res., 19 (1941), No. 12, Sect. C, pp. 485-492, figs. 2*).—Analyses are presented for 1894-1937, expressing each annual sequence as an orthogonal polynomial function of time.

Climatic cycles in relation to the theory and practice of conservation (In *Conservation of Renewable Resources: Some Fundamental Aspects of the Problem. Philadelphia: Univ. Pa. Press, 1941, pp. 57-147, figs. 26*).—The following are included: Dendrochronology and Studies in "Cyclics," by A. E. Douglass (pp. 57-79) (Univ. Ariz.); Periodicities in Solar Variation Reflected in Weather, by C. G. Abbot (pp. 81-88); Conservation and Changing Environment, by P. B. Sears (pp. 89-98); and Climatic Pulsations and an Ozone Hypothesis of Libraries and History, by E. Huntington (pp. 99-147).

Beziehungen von Klima und Witterung zur Häufigkeit der Pflanzenkrankheiten in Schleswig-Holstein [Relations of climate and weather to the incidence of plant diseases in Schleswig-Holstein], W. TRTZCK (*Kühn-Arch., 54 (1940), pp. 403-430, figs. 7*).—Data on plant diseases and insect pests are presented. There are 48 literature references.

SOILS—FERTILIZERS

An outline of the classification of Indiana soils, T. M. BUSHNELL. (Purdue Univ.). (*Ind. Acad. Sci. Proc., 55 (1939), pp. 151-158, fig. 1*).—This is a discussion paper of the factors considered in the classification of Indiana soils. A figure is given, setting forth the factors employed in classifying soils so as to aid in characterizing the various soil series.

The amount and mineral nutrient content of freshly fallen leaf litter in the hardwood forests of central New York, R. F. CHANDLER, JR. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 33 (1941), No. 10, pp. 859-871, figs. 2*).—In closed stands of mixed second-growth hardwoods with dominant trees ranging from 30 to 70 yr., the amount of dry matter deposited annually as leaf litter ranged from 2,425 to 3,020 lb. per acre. The quality of the site had some influence, but the maximum difference between the lowest and the highest soil type was only 236 lb. per acre. The N and Ca contents of the leaves on a percentage basis were not significantly different on the different soils. Mg content was higher and P and K contents lower on the more productive soils. The differences in the average mineral nutrient content of the leaf litter were due more to inherent differences in the normal nutrient content of the litter of the various species than to the influence of the soil type upon the mineral nutrient content of a given species. K content of leaf litter was the least consistent by species, the content being apparently determined more by soil type. The N, Ca, P, K, and Mg contents of the leaf litter from various species are discussed. The average Ca content of the litter was closely correlated with the pH of the

surface soil. The contents of N, P, K, Ca, and Mg in the litter returned to the soil are given in pounds per acre.

Soil and pasture management for Long Island, New York: Soil management. A. F. GUSTAFSON ([*New York*] *Cornell Sta. Bul.* 755 (1941), pp. 3-31, figs. 16).—The climate, drainage and topography, and general agricultural conditions of Suffolk and Nassau Counties are reviewed. The nature, extent, and chemical composition of the various soils found in the areas are considered. Crop adaptations and the fertilizer and management needs for successful crop production on the various soils are given. The importance of lime and organic matter for successful production is emphasized.

A section on pasture improvement and management is noted on page .

Soil erosion studies (*Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 11, pp. 4-5).—Soil and water losses during the calendar year 1940 are summarized for various crop and slope conditions.

Effects of slope, character of soil, rainfall, and cropping treatments on erosion losses from Dunmore silt loam. J. H. LILLARD, H. T. ROGERS, and J. ELSON. (Coop. U. S. D. A.). (*Virginia Sta. Tech. Bul.* 72 (1941), pp. 32, figs. 12).—Soil and water losses under natural rainfall conditions are presented for a 4-yr. period for Dunmore silt loam from run-off plats with slopes of 5, 10, 15, 20, and 25 percent. Each slope was used for a corn, wheat, and clover rotation. Aggregation studies were made on soil from long-time fertility studies in an attempt to determine the cumulative effect of soil treatment on structure as measured by aggregation. Soil-loss measurements indicated that most of the soil loss each year was caused by a few high intensity storms during the spring and summer months, although about one-half of the total rainfall was effective in producing some degree of erosion from cultivated land. Eighty percent of the run-off producing rains occurred during the months of May, June, July, and August. The corn crop was the most erosive, with wheat next and the clover crop providing practically complete protection against erosion on all of the slopes studied. The type of crop and the cultural practices employed influenced the effect of slope on soil loss. Soil loss from corn increased approximately 28 times faster than the water loss as slope increased. Calculated curves for soil and water losses revealed that the average soil loss increased from 3.49 tons per acre on the 5-percent slope to 17.17 tons per acre on the 25-percent slope, while the run-off increased from 2.68 to 3.16 in. Annual soil and water losses from the wheat plats were small and did not show a definite relationship to land slope.

The aggregation studies on Dunmore silt loam from long-time fertility experiments measured the effect of crop, fertilizer, manure, and liming on the physical condition of the soil in a 4-yr. rotation of corn, wheat, clover, and hay. Crop effect on soil aggregation ranked the crops, hay>clover=corn>wheat for 1939, and, after liming in the spring of 1940, hay>clover=corn=wheat. The large aggregates were destroyed by cultivation but formed again when the soil remained in sod for several years. The sod afforded a protective cover to reduce erosion losses and the beneficial effect of the sod on soil tilth carried over to the succeeding crops in this rotation. Clover was the only crop under which the soil showed an increase in the percentage of large aggregates after the application of commercial fertilizer. Applications of manure without lime (pH 5.5) improved the aggregation of the soil under clover but did not significantly affect soil aggregation under corn, wheat, or second-year hay. Applications of manure with lime (pH 6.0) increased the percentage of large aggregates in the soil under all four crops in the rotation.

Conservation farming for the sandy lands of the southern Great Plains. T. DALE (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, pp. [2]+25, pl. 1, figs. 12).—

This and the two publications noted below deal in a closely similar manner with the more difficultly utilized lands of an area comprising parts of Kansas, Colorado, Oklahoma, Texas, and New Mexico included in the southern Great Plains. This publication furnishes practical guidance in soil- and water-conserving methods for farmers of the sandy lands.

Conservation farming for the hard lands of the southern Great Plains, T. DALE (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, pp. [2]+27, pl. 1, figs. 14*).—This publication furnishes practical guidance in soil- and water-conserving methods for farmers of the hard lands.

Conservation practices for the range lands of the southern Great Plains, J. S. McCORKLE and T. DALE (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, pp. [2]+32, pl. 1, figs. 13*).—Practical guidance in soil- and water-conserving methods for the range lands is given under the headings grazing practices, water conservation, development of range-water facilities, gully control, revegetation, ranch management, and wildlife and woodland.

Soil conservation. (Partly coop. U. S. D. A.). (*New York State Sta. Rpt. 1941, pp. 47-48*).—Solution losses in run-off and methods of erosion control are briefly noted.

Organic matter conceptions and misconceptions, F. S. PRINCE. (N. H. Expt. Sta.). (*Better Crops With Plant Food, 25 (1941), No. 7, pp. 20-22, 42-44; also in Amer. Fert., 95 (1941), No. 8, pp. 5-6, 20, 22, 24*).—A general discussion of the effect of organic matter on soil properties, with a consideration of organic-matter losses as well as means of maintaining soil organic matter.

Iodine in relation to plant nutrition, J. C. LEWIS and W. L. POWERS. (Oreg. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 11, pp. 623-637*).—Experiments dealing with the question of the essential nature of iodine in plant nutrition, as well as to determine whether stimulations of plant growth by iodine additions to soils are due to the remedying of a deficiency of an essential nutrient or to some secondary effect of iodine, are given. Additions of iodine to Oregon soils were found to be largely negative. No significant increases in yield were obtained with corn, barley, or lettuce grown in solutions to which small amounts of potassium iodide from C. P. chemicals and distilled water were added. The iodine content of the plant material was found to be linearly related to the concentration of added iodine in the solution cultures. Exploratory pot-culture and field-pot trials on a number of Oregon soils with early nontoxic iodine additions have been largely negative. A statistically interpretable greenhouse trial on Aiken clay loam showed small responses with alfalfa and red clover on the initial cuttings. The authors suggest that iodine may act indirectly rather than by remedying a deficiency of an essential element.

Effect of different soil colloids on the toxicity of sodium selenite to millet, P. L. GILE and H. W. LAKIN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 10, pp. 559-581*).—This investigation deals with the effects of soil colloids on the toxicity of sodium selenite to millet (*Setaria italica*) as determined by vegetative experiments in quartz sand and sand-soil mixtures. Thirty-two soil samples representative of 22 soil types were tested. The specific effects of different soil colloids on selenite toxicity vary more than tenfold. Their effects bear little relation to the great soil groups but are correlated with the total iron content of soil colloids to the degree shown by the coefficient ± 0.51 . Lack of a closer correlation is attributed to varying reactivities of the iron content.

A previous study (E. S. R., 79, p. 598) showed sodium selenate to be unaffected by the soil colloids. Toxicity of the selenite, unlike that of the

selenate, is practically unaffected by the sulfate supply. Plants supplied with sodium selenite contain a higher percentage of selenium in the roots than in the tops. The reverse condition obtains for plants supplied with sodium selenate.

Selenium in soils, grains, and plants in Alberta, O. J. WALKER, W. E. HARRIS, and M. ROSSI (*Canad. Jour. Res.*, 19 (1941), No. 8, Sect. B, pp. 173-178).—Analyses of samples from the Province of Alberta showed a selenium content of 40 soils which varied from less than 0.1 to 1 p. p. m., of 227 wheats from less than 0.1 to 1 p. p. m., and of 4 *Astragalus* plants from 0.3 p. p. m. in the root zone of one plant to 600 p. p. m. in the stalks of another. Some of the soils contained over 0.5 p. p. m. of selenium, and these are looked upon as seleniferous. The data were not sufficient to indicate the extensiveness of seleniferous soils. Analyses of the wheat and soil samples indicated that dangerous areas are more likely to be found in southern rather than central Alberta. A study of vetches indicated that the amount of selenium absorbed is independent of the species and the selenium content of the soil and varies with the part of the plant examined.

Chlorate toxicity and persistence in relation to soil reaction, A. M. HURDKARRER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 8, pp. 481-494, figs. 3).—The toxicity of sodium chlorate to various crop plants was usually greatest in acid, least in alkaline, culture solutions. Differences were less pronounced in soil, presumably being obscured by effects of soil reaction on rate of decomposition of the chlorate.

Chlorate toxicity always persisted longest in limed soils (pH 7.5 or 8) and generally disappeared most rapidly from acid soils (acidified to about pH 5.2 with sulfuric acid). Thus, after the first sowing in a treated soil, chlorate toxicity was always most pronounced in plats that had received lime, and generally least in those that were acid. The outstanding exception to the latter relation was in the case of a soil receiving an application of sodium nitrate.

Some causes of infertility in Montana soils, E. BURKE and H. E. MORRIS (*Montana Sta. Cir. 164* (1941), pp. 23, figs. 11).—This is a general discussion of the causes of infertile soils, pointing out the relationship of nitrogen, phosphorus, sulfur, gypsum, iron, and boron and the lack of inoculation and lime to successful crop production. The authors discuss methods of maintaining nitrogen in the soil.

Testing soils for deficiencies, F. E. BEAR (*New Jersey Stas. Cir. 417* (1941), pp. 8).—The author points out the importance of soil testing for successful crop production. The time and best method for obtaining a soil sample are suggested. Important factors considered in the test, such as pH, phosphate, potash, organic matter, manganese, boron, and lime, are discussed. The author also suggests that it is highly desirable that soil tests be supplemented by plant-tissue tests.

Higher soil fertility fundamental to increased production, D. W. THORNE (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, pp. 1, 4).—A general discussion of the relation of soil fertility to meeting the demands for increased agricultural production created by the food-for-defense program.

Fertilizers and soils for crop production (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 11, pp. 3-4).—Fertilizer recommendations for the various soil types throughout the State are summarized from results of fertilizer tests. The response to phosphorus and potash is considered.

Commercial fertilizers, concerning fertilizer usage, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 476* (1941), pp. 30).—Results of fertilizer and

lime inspections in accordance with the Vermont fertilizer control law are presented. A general discussion is also given on fertilizers and fertilizer usage.

AGRICULTURAL BOTANY

Cornell University abstracts of theses, 1940 (*Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 304-307, 312-314, 319-325, 331-344, 409-411, 431-433*).—The following are of botanical interest: Morphological and Physiological Characteristics of Strains of Yeasts Related to *Saccharomyces ellipsoideus* Hansen and *Saccharomyces cerevisiae* Hansen, by E. A. Beavens (pp. 304-307); Transpiration as Influenced by Osmotic Concentration and Cell Permeability, by T. S. Boon-Long (pp. 312-314); A Study of Certain Factors Influencing the Formation of Carotene in Leaves, by O. F. Curtis, Jr. (pp. 319-321); Plant Technic Studies With Small Grains, by E. E. Down (pp. 322-325); Experimentally Induced Chromosome Doubling in *Solanum tuberosum* L. and Related Tuber-Bearing Species, by F. E. Johnstone, Jr. (pp. 331-334); A Study of Dormancy in Seeds of Certain Species of *Polygonum*, by O. L. Justice (pp. 335-337); Chromosome Studies in Relation to Fertility and Vigor in Inbred and Open-Pollinated Strains of Autotetraploid Maize, by B. S. Kadam (pp. 338-341); The Competition Effect, Size, and Shape of Plat and the Use of Check Plats in Cotton Experiments, by C.-C. Li (pp. 342-344); Influence of Selenium Upon the Growth and Activities of the Rhizobia, by G. O. Mott (pp. 409-411); and Photosynthesis, Transpiration, and Growth of Apple Trees as Influenced by Various Concentrations of Oxygen and Carbon Dioxide in the Soil Atmosphere, by W. H. Childs (pp. 431-433).

[Abstracts of theses] (*Iowa State Col. Jour. Sci., 16 (1941), No. 1, pp. 44-45, 132-133*).—The following are of interest to botany: The Absorption of Radiant Energy in Plants, by J. E. Dinger; and Effect of Carbon Dioxide and Acids on Survival of Micro-organisms, by C. A. Shillinglaw.

Plants used as curatives by certain southeastern tribes, L. A. TAYLOR (*Cambridge, Mass.: Bot. Mus. Harvard Univ., 1940, pp. XI+88, figs. 2*).—Indian herbal remedies are organized from a botanical viewpoint with listing by plant families, genera, and species.

Native trees of Georgia, G. N. BISHOP ([*Atlanta*]: *Div. Forestry, Ga. Dept. Nat. Resources; School of Forestry, Univ. Ga.; Ga. Agr. Ext. Serv., 1940, pp. 96, [figs. 92]*).—In this semipopular manual only 92 of the approximately 250 species native to Georgia are described, these having been chosen for their commercial importance, distribution over the State, or because of some unusual characteristic.

Mycological notes, V, C. L. SHEAR. (U. S. D. A.). (*Mycologia, 33 (1941), No. 3, pp. 318-332*).—A critical taxonomic study of species of *Nummularia* and *Rosellinia* and the new combinations *Melanomma afflatum* and *Dothideovalsa eutypoides*.

Revised descriptions of the genera *Elsinoë* and *Spaceloma*, A. E. JENKINS and A. A. BITANCOURT (*Mycologia, 33 (1941), No. 3, pp. 333-340*).—Revised descriptions of these two genera are presented, with the type species *E. canavaliae* and *S. ampelinum*.

Boletus brevipes Peck in southern California, C. O. SMITH (*Mycologia, 33 (1941), No. 3, p. 333*).—Reported abundant in a pine planting at the Citrus Experiment Station.

Biotic communities of Kaibab Plateau, Arizona, D. I. RASMUSSEN. (Univ. Ill.). (*Ecol. Monog., 11 (1941), No. 3, pp. 229-275, figs. 20*).—Following introductory sections on the physical environment of the area, its history, and the methods and scope of the study, the ecological findings are discussed relative

general community relationships, the woodland climax, the montane forest climax, the mountain grassland, and adjacent communities. Appendixes list the vertebrates, insects, and plants of the area, and there are 42 references.

Plant communities and secondary succession in south-central South Dakota, W. L. TOLSTEAD. (Univ. Nebr.). (*Ecology*, 22 (1941), No. 3, pp. 322-328, figs. 5).—Post climax deciduous and coniferous woodlands, true prairie, and sand-hill grass communities in the vicinity of Rosebud, S. Dak., are briefly described, together with the succession stages and water relations.

Root habits of certain plants of the foothill and alpine belts of Rocky Mountain National Park, A. E. HOLCH, E. W. HERTEL, W. O. OAKES, and H. H. WHITWELL (*Ecol. Monog.*, 11 (1941), No. 3, pp. 327-345, figs. 11).—The authors discuss the root habits of foothill and alpine plants and the environmental factors (evaporation, wind, rainfall, air temperature, relative humidity, and soil conditions) influencing them, these factors being measured in the 8,000-, 10,000-, and 11,500-ft. altitude belts.

An experimental study of rhizomes of certain prairie plants, I. M. MUELLER. (Univ. Nebr.). (*Ecol. Monog.*, 11 (1941), No. 2, pp. 165-188, figs. 35).—This experimental study of the rhizomes of 24 species of prairie plants was made to secure exact information on growth habits, rates of spread in natural habitats and in two types of tilled fields, and responses of certain species to desiccation and deposition of soil. Greatest gains in area were made by species equipped with propagating roots or stolons, and the smallest by those largely dependent on tillering. Advances by rhizomes varied. Rate of propagation by rhizomes was influenced by the time of initiation and duration of the elongation period, the amount of elongation, branching habits, number of buds developed annually, and by growth of tops. There was no correlation between rhizome diameter and rate of propagation. The total rhizome length produced within a given area was greater the less its diameter. When grown in tilled fields the rhizome production in feet per given area of certain forbs compared favorably with that of the grasses normally associated with them. Deeply placed rhizomes were usually robust, but shallow ones were not necessarily slender. Rhizomes growing naturally near the surface were either slender or robust. Details are presented for the various species of grasses and forbs under study.

Comparative efficiency of humus and agar as carriers for legume bacteria of soybeans and peanuts, M. F. SPAULDING (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 259-261).—In general, both humus and agar cultures increased the yields of soybeans and peanuts and there was no consistent differences among different brands of either type of culture. There was, however, a distinct advantage as to crop yields in favor of the agar cultures. Besides differences due to type of culture, a distinct varietal effect was observed, suggesting that certain sorts are better yielders than others on the soil type used in the tests.

Growth studies of *Rhizobium japonicum*, J. B. WILSON and W. W. UMBREIT. (Univ. Wis.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 262-263, figs. 3).—In this study, sucrose in place of mannitol gave a generally unsatisfactory medium. Various added extracts improved growth in sucrose media considerably, but most were less satisfactory than a mannitol medium. Mannitol, however, may be replaced by arabinose with increased growth of *R. japonicum*. It may be supplied as an impure hydrolysate of mesquite gum. The best medium tried was prepared with mesquite hydrolysate supplemented by yeast extract and kraut juice.

Second symposium on development and growth (*Growth Sup., Symposium Developmt. and Growth*, 2 (1940), pp. [2]+154, figs. 34).—The following papers, with discussions, are included: Molecular Structure in Protoplasm, by O. L.

Sponsler (pp. 1-25) (Univ. Calif.), discussion by D. Wrinch (p. 26); The Synthesis of Protoplasm Constituents, by R. Schoenheimer (pp. 27-30), discussion by O. Glaser (pp. 30-32); Colloid Chemistry of Development and Growth, by H. Freundlich (pp. 33-52) (Univ. Minn.), discussion by E. F. Adolph (pp. 52-54); Chemical Factors of Plant Growth, by G. S. Avery, Jr. (pp. 55-72), discussion by K. V. Thimann (pp. 73-74); Physical Factors of Growth, by D. M. Whitaker (pp. 75-88), discussion by E. N. Harvey (pp. 89-99); Cell Division in Relation to Differentiation, by A. B. Dawson (pp. 91-106), discussion by B. H. Willier (p. 107); Size-Controlling Factors, by V. C. Twitty (pp. 109-120); The Pathology of Development, by H. S. N. Greene (pp. 121-123), discussion by S. P. Reimann (pp. 124-125); and The Method and Theories of Physical Science in Their Bearing Upon Biological Organization, by F. S. C. Northrop (pp. 127-154).

Vitamins and recent biological research, E. W. SINNOTT (*Yale Rev.*, 31 (1941), No. 1, pp. 38-52).—A general review of the subject.

The role of hormones in the development of higher plants, W. C. COOPER. (U. S. D. A.). (*Fla. Acad. Sci. Proc.*, 3 (1938), pp. 56-65, figs. 2).—A review (45 references).

Plant growth substances: Their chemistry and applications, with special reference to synthetics, H. NICOL (*London: Leonard Hill, 1940, 2. ed.*, pp. XII+148, [pls. 4], figs. [8]).—A revision of the book noted (*E. S. R.*, 80, p. 460).

A new method for the determination of phytohormone activity, G. E. TURFITT (*Biochem. Jour.*, 35 (1941), No. 3, pp. 237-244, figs. 2).—"Fermentation of yeast has been shown to be mildly stimulated by the presence of minute quantities of the known phytohormones, β -indolylacetic acid, α -naphthylacetic acid, β -naphthylacetic acid, phenylacetic acid. It has not been found possible to standardize experimental conditions sufficiently to justify the use of the method as a sorting test for substances suspected of phytohormone activity. The effect of washing yeast samples before fermentation is to nullify the stimulating effects ordinarily obtained with phytohormones. This is suggested as tentative evidence for the assumption of a phytohormone-bios system, the action of individual members of which is closely interdependent. Contrary to accepted opinion, evidence has been obtained of the stimulation of yeast growth by phytohormones, and several compounds have been tested for phytohormone activity by observing their effects on yeast growth."

Thiazole effect on *Phycomyces*, W. J. ROBBINS and F. KAVANAGH (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 9, pp. 423-427, fig. 1).—From the studies reported it seems clear that the marked increase in growth following addition of excess thiazole to cultures containing thiamin or pyrimidine exists under many variations of the conditions under which *P. blakesleeianus* might be grown in laboratory practice. This is deemed important in using the fungus for bio-assay, because with excess thiazole dry weights greater by 50 percent or more are obtained than would be expected on the basis of the amount of thiamin present.

The pyridine analog of thiamin and the growth of fungi, W. J. ROBBINS (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 9, pp. 419-422).—Both *Phycomyces blakesleeianus* and *Pythiomorpha gonapodioides* obtained pyrimidine from the analog, the first apparently splitting off pyrimidine from the analog molecule and combining it with thiazole to obtain the necessary thiamin and the second splitting the analog molecule to secure pyrimidine, which it combined into thiamin with thiazole synthesized from the sugar and minerals in the medium. The analog was of no use to *Phytophthora cinnamomi*, which required molecular thiamin and was unable to synthesize any part of it or to combine the intermediates even when furnished.

[Botanical reviews] (In *Annual Review of Biochemistry*, X, edited by J. M. LUCK and J. H. C. SMITH. *Stanford University, Calif.: Ann. Rev., Inc.*, 1941, vol. 10, pp. 471-508, 553-618).—The following are of interest to botany: Mineral Nutrition of Plants, by A. L. SOMMER (pp. 471-490) (Ala. Polytech. Inst.); Plant Growth Substances, by W. J. ROBBINS and V. KAVANAGH (pp. 491-508); The Chemistry and Metabolism of Bacteria, by H. A. BARKER (pp. 553-586) (Univ. Calif.); and Biochemical Nitrogen Fixation, by D. BURK (pp. 587-618) (Cornell Univ.).

Combined effects of potassium supply and growth substances on plant development, H. M. LAUDE (*Bot. Gaz.*, 103 (1941), No. 1, pp. 155-167, figs. 6).—Red kidney beans were grown in sand culture at different levels of K and with indoleacetic acid or α -naphthaleneacetamide in the nutrient solution in a series of concentrations. Plants receiving different solutions but externally appearing alike responded in a markedly different manner to indoleacetic acid treatment. Relatively high K was necessary to obtain increased dry weight of the total plant by the acid treatment. At certain levels of nutrition, increases as great as 12.5 percent in total plant dry weight were obtained by the acid supplied at the 10^{-8} concentration, and significant increases occurred at 10^{-7} , 10^{-8} , and 10^{-9} . Indoleacetic acid appeared unable either to replace K or enhance its utilization under deficiency conditions. The time of flowering was not hastened by the acid treatment, nor was there indication that the acetamide accelerated the appearance of flower buds. The number of leaves per plant was not increased by either growth substance, though leaf size varied considerably. The percentage dry weight increased as K decreased, and only at relatively high concentrations of the acid (10^{-4}) was increased succulence noted. Plants at four K levels yielded the same general trend of response to the acetamide treatment, differing only in degree in that dry weights were less with decreasing K. Dry weights of roots increased 34-58 percent, but growth of tops was significantly reduced at the 10^{-6} concentration of the acetamide. The first visible K-deficiency symptom was expressed by the primary leaf blade retaining the nocturnal pendant position during the day. There are 17 references.

Nitrate content of some South Dakota plants, O. E. OLSON and E. WHITHEAD. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 20 (1940), pp. 95-101).—Analyses of several samples of oats hay and pigweed (*Amaranthus retroflexus*) indicated several of each to contain toxic amounts of KNO_3 . Analyses of sorghum samples showed that in some cases toxicity of this plant may be due to the high nitrate content rather than to HCN. Stage studies of *Chenopodium album*, *Helianthus* sp., *Grindelia squarrosa*, and *Tradescantia bracteata* showed a decrease in their nitrate-N content during the growing season. Grasses were found to be generally low in nitrate-N content.

Devernalization of vernalized winter wheats, A. K. EFEIKIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 30 (1941), No. 7, pp. 661-663, figs. 2).—Using wheat seedlings for the studies reported, it is concluded that vernalization is a reversible process.

Respiration in the living cell, P. S. TANG (*Quart. Rev. Biol.*, 16 (1941), No. 2, pp. 173-189).—A monographic review (84 references).

Spraying with microelements as a method of increasing the rate of photosynthesis, A. A. RICHTER and N. G. VASSILIEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 30 (1941), No. 7, pp. 659-660).—The data presented together with an array of similar results obtained in other tests are said to have furnished evidence that very weak solutions of trace elements (salts containing Mn, Zn, I, and B) sprayed once on the leaves of various plant species will increase their assimilatory capacity, and that this effect will not vanish for several days, only gradually decreasing in strength.

The effect of light on the inherent E. M. F. of *Valonia ventricosa*, I, II, G. MARSH (*Carnegie Inst. Wash. Pub. 517* (1940), pp. 65-84, figs. 5; 99-120, figs. 3).—The first two papers in this series are as follows:

I. *Intensity and time relations*.—It is concluded that the effect of light on the e. m. f. is primarily due to O₂ release in photosynthesis. The results of the study are said to be in harmony with Lund's flux-equilibrium concept for an oxidation-reduction system as the source of the electrical energy. There are 32 references.

II. *The relative energy absorption spectrum*.—From data for four of the light filters used it was possible to divide the spectrum into five regions: 400-450, 450-500, 500-590, 590-650, and 650-700 m μ . These regions approximately isolate the four main absorption peaks and the absorption minimum for the two chlorophyll components. It is concluded that chlorophyll is the photosensitive material absorbing the radiant energy responsible for the effect of light on the protoplasmic e. m. f. in this alga. The chlorophyll system is therefore an intimate part of the electromotive mechanism. It is pointed out that the effect of light on the e. m. f. is independent of its effect on the permeability of the plasma membranes, even though some vague, secondary control is exerted on membrane properties through metabolism (photosynthesis). There are 33 references.

The effect on the formation of carbohydrates in leaves of the omission of red and blue-violet rays from electric light, R. E. COOPER and R. B. M. COLAH (*Ann. Bot. [London], n. ser., 5* (1941), No. 17, pp. 170-173).—In this study the amounts of carbohydrates formed in ordinary electric light were higher than the amounts formed when either the blue-violet or red rays were excluded, the total energy value of the light remaining the same. The depression was greater with the absorption of the red rays than with that of the blue-violet. Carbohydrate formation was, however, greater in white light than in the light after the loss of the blue-violet rays, although such light contains a higher proportion of red rays than the white light.

The association of different alterations in self-fertile X-rayed derivatives of *Neurospora tetrasperma*, W. S. MALLOCH (*Mycologia, 33* (1941), No. 5, pp. 540-554).—Cultures were raised from ascospores of *N. tetrasperma* exposed to Grenz radiation and hard X-rays. Frequency distributions for ascospore production, color of substratum, conidiospore production, and perithecial development in the two series were not homogeneous. In the two populations, correlation data for six different character contrasts were not homogeneous. The chi-square tests indicated that good ascospore production was associated with normality in perithecial development, color of substratum, and conidiospore production, and each of these characters was associated with all the others. Progeny tests indicated that certain induced alterations were unstable and returned to normal in the next generation, whereas others segregated into well-defined genetic types. Thus the observed associations were sometimes due to genetic factors and sometimes to the fact that the treatment was sufficiently strong to affect two characters simultaneously.

[Botanical studies by the New York State Station] (*New York State Sta. Rpt. 1941, pp. 48-49*).—Brief notes are included on studies of the interaction of hydrocarbons and plant tissue, with special reference to mitotic changes; interaction of X-rays and plant nuclei; photographic determination of chromosome structure; and induced variants and progenies of induced polyploids.

Methoxyl derivatives of benzene and naphthalene studied with regard to their polyploidogenic action of plants, A. SHMUCK and A. GUSSEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30* (1941), No. 7, pp. 639-641).—Using wheat seedlings and introducing the compounds tried as ether solutions

on filter paper placed in petri dishes, the conclusion drawn from the tests reported is that only in a small proportion of cases do the methoxyl groups introduced into the molecule of benzene or naphthalene impart the polyploidogenic activity to the derivatives obtained in this way. Only the α -derivatives of naphthalene were found to be active.

Activity of polyploidogenic compounds as influenced by hydrogenation, A. SHMUCK and A. GUSSEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 7, pp. 642-643*).—"While the hydrocarbons endowed with polyploidogenic power as surely lose it in response to hydrogenation as does colchicine, the derivatives of hydrogenated hydrocarbons which have preserved their functional groups in the aromatic nucleus retain some part, if not a very considerable one, of the former activity."

Pasternack's paraffin method modified for plant tissue, K. R. KERNS. (Hawaii. Pineapple Prod. Expt. Sta.). (*Stain Technol., 16 (1941), No. 4, pp. 155-156*).

An apparatus for washing tissue, H. KERSTEN and G. F. SMITH (*Stain Technol., 16 (1941), No. 4, pp. 157-158, fig. 1*).—The authors describe and illustrate an easily constructed apparatus found useful in washing large numbers of individual specimens preparatory to making histological sections and particularly applicable to handling successive portions of relatively large structures to be studied in series.

Acetic orcein: A new stain-fixative for chromosomes, L. LA COUR (*Stain Technol., 16 (1941), No. 4, pp. 169-174, figs. 3*).—Results with this method are said to be equally good for fresh and permanent mounts.

Progress in the standardization of stains: No further certification of gentian violet, H. J. CONN (*Stain Technol., 16 (1941), No. 4, pp. 141-142*).

A plasticized polystyrene mounting medium, S. H. HUTNER (*Stain Technol., 16 (1941), No. 4, p. 177*).

Preparing permanent deep chamber mounts of variable dimensions, D. L. BASSETT (*Stain Technol., 16 (1941), No. 4, pp. 165-168*).—"A rapid and simple method for the preparation of permanent deep chamber mounts of variable size, shape, and depth is described. The chamber sides are made with aluminum wire bent on a form of the proper size and shape. Aluminum wire is nicely adapted for use due to its pliability and clean appearance. It undergoes no apparent change in contact with the mounting medium. Depth of the chambers is determined from the gage of the wire. Clarite, used as the mounting medium, is prepared as a thick solution in toluol (70-75 percent of clarite by weight). The resulting preparations are crystal clear, colorless, and, according to the work of other investigators, do not become acid with age."

Collapse in wood as shown by the microscope, H. D. TIEMANN. (U. S. D. A. coop. Univ. Wis.). (*Jour. Forestry, 39 (1941), No. 3, pp. 271-282, figs. 10*).—The technics of preparing wood specimens and making photomicrographs are briefly outlined, and the main features of collapse for aspen, oak, western red cedar, yellow poplar, and eucalyptus are described, with illustrative photomicrographs for all but the last.

Structure of stems in relation to differentiation and abortion of blossom buds, B. E. STRUCKMEYER. (Wis. Expt. Sta.). (*Bot. Gaz., 103 (1941), No. 1, pp. 182-191, figs. 38*).—Soybean, *Salvia*, *Cosmos*, and *Xanthium* (short-day plants) initiated blossom primordia after different durations of exposure to short days (requiring 9, 9, 12, and 5 short-day treatments, respectively), whereas stock (a long-day plant) required about 18 days. For blossom primordia to continue development it was necessary to expose these plants (except *Xanthium*) to a favorable environment for a longer time than merely the induction period.

Alterations in stem structure occurred early in the development of plants placed in an environment favorable to the formation of blossom primordia. The first indication of such changes was a decrease in the number of meristematic cells of the cambial zone, associated with a decrease in the formation of xylem and phloem cells and a thickening of the cell walls of the vascular tissues. The cambium generally remained somewhat active, giving rise to a new xylem but to little phloem. The most recently formed phloem was composed almost entirely of phloem parenchyma cells. The stems of flowering and fruiting plants had little or no meristematic tissue, and the walls of the cells had become greatly thickened. Exposed to a favorable flowering environment for a limited time only and then returned to conditions inductive to vegetative growth, all tested species except *Xanthium* soon showed renewed cambial activity and differentiation of vascular elements with failure of the blossom primordia to continue development. *Xanthium* plants given 2-3 short days became reproductive regardless of subsequent treatment.

Histological studies on the root of *Melilotus alba*, F. R. BOTTUM (*Bot. Gaz.*, 103 (1941), No. 1, pp. 132-145, figs. 14).—The histology of the white sweetclover roots and root nodules are followed through ontogeny.

Observaciones citogenéticas sobre girasol (*Helianthus annuus*) [Cytological observations on sunflower], R. CONSTANCIO LÁZARO (*Rev. Facult. Agron. [Montevideo]*, No. 23 (1941), pp. 59-67, figs. 8).—Studies of meiosis and mitosis are presented.

Microbial responses to organic amendments in Houston black clay, R. B. MITCHELL, J. E. ADAMS, and C. THOM. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 9, pp. 527-534, figs. 7).—"Curves for temperature, moisture, and microbial numbers were established for selected plats of Houston soil as a background for studies in root rot control. As an environment for microbial activity, the plats of Houston soil studied furnish the following striking features: (1) In a period between early December and February the temperatures remained below those required for actual microbial multiplication, yet without freezing. (2) Temperatures ranged above 70° F. from March to November, and from 80° to 90° from June to October. (3) Bacteria and actinomycetes are much more active and abundant than has been reported for northern soils. Maxima for total colony counts in soils receiving organic amendments reach 200 to 400 millions; actinomycetes at times reach 50 and 90 millions to the gram. Such responses to added organic nutrients present a challenge to the worker to search for organic media and agronomic practices capable of yielding a controlled microflora."

GENETICS

Summary of barley breeding and genetic studies in progress, 1939-1940, D. W. ROBERTSON and G. A. WIEBE. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., 1940*, pp. [2]+23).—Barley workers are listed with their parent materials and are grouped as to studies in genetics (linkage), disease resistance, species crosses, and cytogenetics.

Heritable characters in maize.—51, "Knotted leaf," A. A. BRYAN and J. E. SASS. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Hered.*, 32 (1941), No. 10, pp. 342-346, figs. 4).—The series (E. S. R., 81, p. 495) is continued. Knotted leaf (*Kn kn*) is inherited as a simple dominant. In general knotted plants are somewhat shorter and later than their normal sibs and exhibit characteristic "knots" on the leaf blades and sheaths. Some plants have only a few scattered knots on the leaves, while in others the upper leaves may be affected so severely that the tassels emerge very late or not at all. The knots appear

to be the result of localized proliferation of mesophyll parenchyma and very restricted proliferation of procambial cells in the meristematic region of the leaf; subsequent expansion of these regions, acting against the normal areas, produces the described distortions.

Cytogenetic studies of a case of pollen abortion in maize, C. R. BURNHAM. (Minn. Expt. Sta.). (*Genetics*, 26 (1941), No. 4, pp. 460-468).—Plants heterozygous for a gene for pollen abortion, *pa*, found in an established inbred line, have semisterile pollen yet normal ears. This gene is lethal, or nearly so, to pollen carrying it, but not to ovules through which *pa* is transmitted. It is located in chromosome I, between *P* and *br* (brachytic), the order and recombination values from direct linkage tests being $P_{30} pa_{34} br$. No cytological abnormality was located in chromosome I of plants carrying *pa*.

Translocations in maize involving the short arm of chromosome I, E. G. ANDERSON (*Genetics*, 26 (1941), No. 4, pp. 452-459).—Data on linkage and cytological relationships of eight translocations located in the short arm of chromosome I of corn are summarized. One is to the left of *sr* (striate leaf) and seven are to the right of *P* (pericarp color) ranging from 0.8 to 24 units.

Inheritance of sorus characters in hybrids between *Ustilago avenae* and *U. perennans*, G. W. FISCHER and C. S. HOLTON. (Wash. Expt. Sta. coop. U. S. D. A.). (*Mycologia*, 33 (1941), No. 5, pp. 555-567, figs. 3).—In crosses between these two smut fungi involving the sorus characters, viz, indurate, covered, naked, and powdery, the last two proved dominant over the first two. Independent inheritance of these characters was indicated by the fact that naked powdery, naked indurate, covered powdery, and covered indurate segregates were produced in the F_2 . In the F_3 these segregates broke up as follows: The naked powdery segregate gave rise to all four of the above segregates; the naked indurate produced naked indurate and covered indurate types; the covered powdery produced covered powdery and covered indurate types; and the covered indurate proved to be doubly homozygous in yielding only the covered indurate sorus type. In crosses of *U. perennans* with a race of *U. avenae* having normal powdery sori, only the covered v. the naked sorus characters were studied. Again it was found that the naked sorus character is dominant over the covered type. The susceptibility of cultivated oats to *U. perennans* was demonstrated, but tall oatgrass has not been found susceptible to *U. avenae* or to hybrids between the two species. That *U. avenae* and *U. perennans* are synonymous is indicated by the morphological identity of their chlamydospores, their genetic relationship, and their host range. A consolidated species would, by priority, be designated *U. avenae*.

Meiotic behavior of *Phleum pratense*, *Phleum subulatum*, and their F_1 hybrid, W. M. MYERS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 11, pp. 649-659, figs. 3).—In *P. pratense* (timothy), at diakinesis, 33.3 percent of the sporocytes had 21 bivalents, 2.8 had 20 bivalents plus 2 univalents, and 63.9 percent had from 1 to 3 quadrivalents plus from 19 to 15 bivalents. Four quadrivalents were observed rarely. Chiasma frequency was low, and about one-half of the bivalents had a chiasma in only one arm. The 14 chromosomes of *P. subulatum* normally were associated as 7 bivalents at diakinesis and metaphase I. In 1.1 percent of the sporocytes 6 bivalents plus 2 univalents were present. Chiasma frequency at metaphase I averaged 1.85 per bivalent. Anaphase I was regular, but at anaphase II some lagging univalents occurred, resulting in chromosomes being left in the cytoplasm in 2.47 percent of the quartets.

P. pratense \times *P. subulatum* had 28 chromosomes. At metaphase I the chromosomal association ranged from 7 bivalents plus 14 univalents to 12 bivalents plus

4 univalents. Univalents were oriented in a regular manner on the equatorial plane. Lagging univalents undergoing equational division were found in all anaphase I sporocytes, averaging 8.9. At metaphase II most of the daughter univalents congressed normally but did not divide at anaphase II. Laggards occurred at anaphase II in all sporocytes, resulting in irregular quartet formation. The hybrid resembled *P. pratense* morphologically. It was completely male sterile, since the anthers did not dehisce, but was partially female fertile with *P. pratense* pollen.

The genetical behavior of three virescent mutants in Asiatic cotton, C. P. YU (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 756-758).—The virescent genes v_2 , v_3 , and v_4 , mutants affecting the chlorophyll content, occurred in pure lines of Asiatic cotton, and with their allelomorphs showed simple Mendelian inheritance. The v_1 and v_2 segregate independently and are complementary factors. The v_3 and v_4 , also two different genes, segregate independently. The v_4 shows independent inheritance with genes for anthocyanin pigment, corolla color, and curly leaf.

Increased size and nicotine production in selections from intraspecific hybrids of *Nicotiana rustica*, H. H. SMITH and C. W. BACON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 8, pp. 457-467, figs. 2).—New lines of *N. rustica*, developed by hybridization and selection, averaged significantly larger than the parental strains of *N. rustica brasilia* (strain 34753), tall type, and Olson 68. Plant height, number of leaves, and size of largest leaf, the characteristics measured, were controlled by relatively independent genes that could be recombined in advantageous groupings. The best parent values usually were not exceeded until new homozygous combinations were established in F_2 or later generations. The original strains differed by some genes for each character. Further increases in size were obtained by intercrossing F_2 selections of the new lines, and occurrence of some exceptionally large segregants suggested the possibility of still further increases in average size. Selections in the new strains, to the F_3 generation, were found superior to their original parents in estimated potential yields of nicotine per acre. The possible economic importance of the improved lines, for use as a source of nicotine for insecticidal purposes, is discussed.

Green cotyledon, a new character in the mature lima bean (*Phaseolus lunatus* L.), R. MAGRUDER and R. E. WEBSTER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 581-584).—Detailed observations on green-seeded Henderson and Henderson Bush lima beans revealed no vegetative, seed pod, or seed differences, except that the seeds of the first variety, upon drying, remained green while those of the regular Henderson Bush turned white or light cream. It is suggested that the green type probably arose as a mutation from the light-colored type. In crosses between green-seeded and white- or light cream-seeded plants, all of the F_1 s were white or light cream in seed color. Observations on the F_2 s indicated that the green-colored cotyledon character is a monogenic recessive to the white or light cream color. When cooked in the same manner, there was no difference in flavor or texture between the green- and the light-colored beans.

Genetic studies of variegation in snap beans, B. L. WADE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 11, pp. 661-669, fig. 1).—The variegation studied is expressed over a wide range, from a trace up to a very severe, semilethal condition. The range is approximately the same for variegated lines due to one, two, or three factors, but the average amount of variegation for three factors is more than for one or two, and the average for two more than for one. The variegation considered is due to any one of three recessive factors, whereas the normal condition is due to the complementary action of three dominant genes

giving in F_2 a ratio of 27 normal to 37 variegated for the cross of Black Valentine with the original variegated strain and the reciprocal cross. Studies of F_3 and some F_4 families were made, as well as studies of crosses between the various variegated types.

Parthenocarpy in a tomato deficient for a part of a chromosome and in its aneuploid progeny, M. M. and J. W. LESLEY. (Calif. Citrus Expt. Sta.). (*Genetics*, 26 (1941), No. 3, pp. 374-386, figs. 6).—A very small plant, occurring in the F_1 from diploid dwarf parents, flowered freely and produced very small yellow fruit, mostly without seeds. There was very little pollen, many of the anthers being completely empty. It is suggested that the plant, a deficient diploid, arose from the egg cell of a deficient female gametophyte and a normal male gamete. The aneuploid derivatives of the deficient plant included a primary trisomic, a deficient trisomic, a deficient tetrasomic, and a secondary trisomic. These were all relatively fruitful, with a tendency to parthenocarpy. The parthenocarpic tendency of the deficient diploid and its aneuploid progeny suggested that the same chromosome was involved in all, and that apparently in the whole chromosome the gene balance was favorable to parthenocarpy. Except in the deficient tetrasomic, which set fruit without pollination, parthenocarpy was stimulative.

Genetic stability of haploid, diploid, and tetraploid genotypes in the tomato, E. W. LINDSTROM. (Iowa Expt. Sta.). (*Genetics*, 26 (1941), No. 4, pp. 387-397).—Observations based on a tomato haploid maintained asexually for 14 yr. showed a surprising stability of the genotype, with no diploid sectors or mutants. Only one somatic mutant, a presumptive change to the "wiry" condition, was recorded in the 14 yr. The haploid developed a form of natural immunity to virus infection and showed a masked type of aucuba infection. The absolutely homozygous diploid derived asexually from the sterile haploid was highly fertile. One new, recessive, monogenic variant arose in the control line. This was a new wiry (w_2) mutant, different genetically from the original wiry mutant. In the absolutely homozygous autotetraploid derived originally from the haploid via the diploid, selection for increased fertility in this highly sterile form was of no avail through eight generations, involving 410 plants.

A genetical interpretation of sex determinations in *Carica papaya* L., W. B. STOREY (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press., 1941, pp. 358-360*).—From the results of crosses between female, hermaphrodite, and male plants, the author reached the following conclusions: (1) The factors for sex expression in the papaya are inherited as simple Mendelian units and are allelomorphic, (2) the female tree represents a homozygous recessive genotype and the male and hermaphrodite are enforced heterozygotes, and (3) all combinations of homozygous genotypes are lethal to the zygotes. Seed counts tended to support the above conclusions, and cytological observations confirmed the opinion of other workers that no heteromorphic pair of sex chromosomes may be discerned.

Inheritance of seed characters in watermelon, C. F. POOLE, P. C. GRIMBALL, and D. R. PORTER. (U. S. D. A. coop. Univ. Calif.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 8, pp. 433-456, figs. 13).—Three seed-length phenotypes were used in this study, conducted since 1936 at the U. S. Regional Vegetable Breeding Laboratory, Charleston, S. C. They were short (average about 6 mm.), medium (average about 10 mm.), and long (average about 13 mm.). The phenotypes behaved with respect to each other as belonging in a dihybrid F_2 segregation of 9 medium (LS) to 3 long (lS) to 4 short (Ls and ls). The 5 parent seed-coat color phenotypes used were black, clump, tan, white-tan-tip, and white-pink tip. Seven parental combinations were made out of a possible 10. Seed-coat color

and patterns were determined by the interaction of 3 main genes *RTW* and 1 specific modifier *D* operating on black alone. The only linkage found was between *L* and *W*. Besides genetic interest, the results have practical value in improvement studies with the watermelon.

Further chromosome studies of some varieties of blackberries, H. E. FISCHER, G. M. DARROW, and G. F. WALDO. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 401-404).—Of 16 selections of wild blackberries collected in northwestern California and western Oregon and Washington, 5 were found to be hexaploids, 8 octoploids, and 3 twelve-ploids. The two recently named varieties, Pacific and Cascade, obtained from crosses of a dodecaploid, Zielinski, by Logan, were found to be nonaploids. Since these unbalanced types were sufficiently fruitful to have promise as commercial varieties, it appeared that in the higher polyploids the degree of unbalance due to the extra set of chromosomes does not appreciably affect fertility. A potent cause of sterility in higher polyploids, particularly species hybrids, is the partial or complete failure of chromosome association between genomes contributed by the parents. Of some 124 selections made at Corvallis, Oreg., from crosses involving plants with different chromosome numbers, all except 2 had presumably odd numbers of chromosomes in the egg and pollen cells. An extra set of chromosomes may be of relatively little importance in producing sterility in allopolyploid species hybrids.

Periclinal and total polyploidy in cranberries induced by colchicine, H. DERMEN and H. F. BAIN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 400).—Cranberry seedlings grown aseptically on agar in test tubes were treated with aqueous solutions of colchicine of 0.05-, 0.1-, and 0.2-percent concentrations. An examination a few months later, using stoma size as a criterion, showed that polyploidy was rare in the 0.05-percent treatment and was most frequent in the 0.2-percent treatment. Cytological examination of growing branch tips revealed two types of polyploidy—(1) total, where the internodes were shortened and the leaves changed in thickness and form, and (2) confined to the epidermis, where large stomata indicated the principal change. The application of drops of glycerin-colchicine solutions to the tips of growing shoots produced polyploidy in certain commercial varieties, as indicated by stomatal examination.

Biology of the laboratory mouse, edited by G. D. SNELL (*Philadelphia: Blakiston Co.*, [1941], pp. IX+497, figs. 172).—A group of articles is presented on various phases of development, genetics, nutrition, pathology, and management of mice for laboratory purposes, as prepared by the Roscoe B. Jackson Memorial Laboratory, with a chapter on infectious diseases of mice, by J. H. Dingle.

Fertility in mammals and birds, J. HAMMOND (*Biol. Rev. Cambridge Phil. Soc.*, 16 (1941), No. 3, pp. 165-190).—Fertility in birds and mammals is discussed with reference to the ova produced and fertilized and the embryos developing to birth, together with an extensive bibliography of 268 references.

Congenital external and internal anomalies in a foal, T. T. DAVID and J. A. SOLIS (*Philippine Jour. Sci.*, 74 (1941), No. 3, pp. 231-245, pls. 3).—The structures of a full-term foal born with only rudiments of forelegs and with certain characteristics of both sexes are described.

Zebu (Brahman) cross cattle and their possibilities in North Australia (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 2, pp. 161-164, pls. 6).—A study of 5,109 purebred and hybrid Brahman (Zebu) cattle produced at five experimental farms in North Australia showed that in the first cross the Brahman hump and ear lengths were considerably reduced, and the back line

was straightened. In further crosses, 25 to 50 percent Brahman blood was considered as a maximum. The habits are described. It was considered that carcasses of half- and quarter-bred Brahman steers complied with requirements of the Australian export trade.

Frequency of use of polygamous fox males, C. F. BASSETT and J. R. LEEKLEY (*Amer. Fur Breeder*, 14 (1941), No. 5, pp. 40-42).—Polygamous use of ♂ foxes at the Fur Animal Experiment Station, U. S. Department of the Interior, showed that frequent matings, even on successive days, were not harmful from a production standpoint. Only 1 of 17 vixens mated at different times with 9 ♂s over 4 yr. failed to produce young. Many of the skips or misses of pregnancies were because of conditions over which the ♂ was not responsible.

Embryology of hereditary brachydactyly in the rabbit, O. R. INMAN (*Anat. Rec.*, 79 (1941), No. 4, pp. 483-505, pls. 2).—The embryological development of rabbits exhibiting brachydactyly, previously noted by Greene and Saxton (*E. S. R.*, 81, p. 194), is described.

A case of true hermaphroditism in the field mouse, S. A. ASDELL, W. J. HAMILTON, JR., and K. P. HUMMEL. (Cornell Univ.). (*Anat. Rec.*, 80 (1941), No. 1, pp. 47-53, figs. 3).—The anatomy of a field mouse is described in which there was a testis with usual ♂ organs on the left side and an ovary with an oviduct and uterus on the right.

Studies on an anophthalmic strain of mice.—I, Embryology of the eye region, H. B. and E. B. CHASE. (Univ. Ill.). (*Jour. Morphol.*, 68 (1941), No. 2, pp. 279-301, pls. 3).—The embryological development of the eye region of a normal strain of mice is compared with that of the anophthalmic strain.

Studies on an anophthalmic strain of mice.—II, Effect of congenital eyelessness on reproductive phenomena, E. B. CHASE. (Univ. Ill.). (*Anat. Rec.*, 80 (1941), No. 1, pp. 33-36).—The strain of eyeless mice showed no retardation in sexual development as compared with normal black mice. Although the eyeless strain was possibly younger at vaginal opening and at the time of the first cornified vaginal smear than normal blacks, ♂s and ♀s from the two strains did not differ significantly in the other normal reproductive phenomena.

[Abstracts of papers presented at the 33rd annual meeting of the Poultry Science Association—August 12-15, 1941, Stillwater, Oklahoma] (*Poultry Sci.*, 20 (1941), No. 5, pp. 454-478).—The following papers are concerned with poultry genetics (for papers on poultry production and management see p. 516): Modification of Comb Characters in Chickens, by H. E. Alder (p. 454) (Univ. Nebr.); Crossbreeding and Heterosis in Turkeys, by V. S. Asmundson (pp. 454-455) (Univ. Calif.); A Spectrophotometric Study of Feather Pigments, by B. B. Bohren and R. M. Conrad (p. 456) and Relation of Day-Old Chick Wing Feather Development to Feathering at the Broiler Age, by M. I. Darrow (p. 458) (both Kans. State Col.); Hereditary Chondystrophy in the Fowl, by W. F. Lamoreux (p. 465) (Cornell Univ.); Crosses Between Inbred Lines of the Domestic Fowl, by A. J. G. Maw (p. 465) (Iowa State Col.); A Recessive Autosomal Factor for Slow Feathering in Single Comb White Leghorn Chicks, by C. F. McClary and G. E. Bearse (pp. 466-467) (West. Wash. Expt. Sta.); Some Characteristics of the Ovomucin Gel of Thick Egg White, by E. H. McNally (p. 467) (U. S. D. A.); A Study of the Effect of Sunlight, Dubbing, and Fractionated Anterior Pituitary Extract Upon Growth, Endocrine Glands, and Sexual Capacity of Single Comb White Leghorn Cockerels, by N. Nikolaiczuk and W. A. Maw (pp. 469-470); Comparative Gonadotropic Potency of Unfractionated Extracts of Poultry Pituitaries, by R. E. Phillips (p. 471) (Iowa State Col.); A Study of the Inheritance of Resistance to *Eimeria tenella* in the Domestic Fowl, by M. M. Rosenberg (p. 472) (Tex. A. and M. Col.); A New Type of Nakedness

in the Domestic Fowl, by P. D. Sturkie (p. 474) (Ala. Sta.); Results of Cross-breeding Poultry, by D. C. Warren (p. 476) (Kans. State Col.); and A Study of Body Weight in Nine Different Strains of White Leghorns, and A Lethal Embryonic Wing Mutation in the Domestic Fowl, both by N. F. Waters and J. H. Bywaters (pp. 476-477) (U. S. D. A.).

Pedigree breeding of poultry, I. V. AUSTRIA (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 2, pp. 99-126, pls. 9, figs. 10).—An account is given of the records necessary to be taken into consideration in pedigreeing poultry and making plans for them.

A semi-lethal mutation in fowl affecting length of the upper beak and of the long bones, W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (*Genetics*, 26 (1941), No. 4, pp. 426-439, figs. 3).—The degree of shortening and crossing of the upper beak and shortening of the long bones in fowls was variable but furnished evidence that the mutation was recessive, autosomal, and semilethal. Sixty-one "short upper beak" embryos, alive or dying before hatching, showed that the long bones were shorter than in normal embryos. In the leg the tarso-metatarsus was more shortened than the femur or tibia, and the tibia was more shortened than the femur. Differences were less conspicuous in the wings. There did not appear to be a correlation between the degree of abnormality of the beak and the degree of shortening of the long bones or polydactyly. The weight of short-beak embryos averaged somewhat less than that of normals. In short upper beak embryos it was concluded that development proceeded at a slower rate than in normals. Among 652 embryos from heterozygous matings and 250 backcross progeny which survived more than 18 days, 25.5 and 47.6 percent, respectively, had shortened beaks. There were no short upper beak progeny among 73 embryos and chicks from matings of a homozygous normal ♀ × a homozygous short upper beak ♂.

Inheritance of white plumage in Phasianus, J. H. BRUCKNER. (Cornell Univ.). (*Auk*, 58 (1941), No. 4, pp. 536-542, pl. 1).—In further study of color inheritance in pheasants (E. S. R., 81, p. 357), white (c) behaved as a single, autosomal gene recessive to the ringneck patterns. F₂s from reciprocal crosses of ringneck and white produced 149 ringneck : 48 white birds. In the backcross hatched and dead embryos there were deficiencies in the numbers of whites, but they were not significant. The white F₂ birds produced 75 F₂s, all white.

Sex differentiation of chick and duck gonads as studied in homoplasmic and heteroplasmic host-graft combinations, E. M. BRADLEY (*Anat. Rec.*, 79 (1941), No. 4, pp. 507-529, pl. 1).—Homoplasmic and heteroplasmic grafts of chick gonad primordia and testis primordia of the duck have the capacity for self-differentiation as to sex in 72- to 96-hr. chick embryos and 96- to 120-hr. duck embryos. The rate of growth and differentiation characteristic of the donor is maintained regardless of the host, but modifications in development occurred on both hosts, showing that both ♂ and ♀ sex hormones of the host were active in gonad development. Although about half of the 109 gonads persisting showed both ovarian and testicular tissue, the numbers of complete ♂s and ♀s were about equal, suggesting a lack of general sex modification. The grafts were developed for from 4 to 20 days on the embryos.

Selective neutralization of the follicle-stimulating action of gonadotropic preparations by antigonadotropic sera, H. S. KUPPERMAN, R. K. MEYER, and W. H. McSHAN. (Univ. Wis.). (*Endocrinology*, 29 (1941), No. 4, pp. 525-530).—Injection of FSH (follicle-stimulating hormone), PMS (pregnant mare serum), SAP (anterior pituitary serum), and LH (lutinizing hormone) into rabbits produced an antiserum to the gonadotropic action of the specific products on ♂

and ♀ rats. For example, when FSH alone was injected into ♀ rats for 4.5 days, the ovaries averaged 75 gm., but when anti-FSH was also injected the ovarian weights averaged 8 and 13 gm. Similar effects were obtained with the other hormones. The luteinizing activity of the extracts, as determined by the response of the ♂ accessory organs, was not neutralized by the anti-FSH serum.

Gonad response of male rats to experimental hyperadrenalism, J. C. FERRY (*Endocrinology*, 29 (1941), No. 4, pp. 592-595, figs. 4).—The daily injection of ♂ rats with from 1 to 4 minims of adrenalin caused a regression in the size of the testicles and secondary sex characters with complete suppression of spermatogenesis in some cases.

The baby cockerel test for androgens, W. H. HOSKINS, G. W. BEACH, J. R. COFFMAN, and F. C. KOCH (*Endocrinology*, 28 (1941), No. 4, pp. 651-653, figs. 2).—Comb growth responses to the same androgens but by different methods of treatment were so irregular in baby chick tests as to cause the authors to conclude that this method is not as reliable as the capon test.

The use of the chick for the assay of androgens, D. R. McCULLAGH and R. GUILLET (*Endocrinology*, 28 (1941), No. 4, pp. 648-650, fig. 1).—Responses in the comb to doses of from 0γ to 4γ daily, applied by inunction, were calculated as $y=0.35+0.23x-0.02x^2$, wherein y refers to comb weight in milligrams divided by body weight in grams and x signifies the androgen dose in gamma. The capon method continues to be the method of choice in the bio-assay of androgens.

The chick comb response to androgens, P. A. DUFF and H. H. DARBY (*Endocrinology*, 28 (1941), No. 4, pp. 643-647, figs. 6).—So much variation was found in the chick comb response to known doses of androgens in the tests of Frank et al. (E. S. R., 81, p. 197) and of R. I. Dorfman and W. W. Greulich¹ that assay of samples by these methods was impossible.

Forty-eight-hour response of the immature male rat to androgens, R. R. GREENE and M. W. BURRELL (*Endocrinology*, 29 (1941), No. 3, pp. 402-408, figs. 3).—The seminal vesicle weight of 22- to 24-day-old ♂ rats weighing from 26 to 36 gm. showed less variability than that of 32- to 38-day-old rats weighing from 65 to 85 gm., previously noted (E. S. R., 85, p. 37). Rats from 20 to 22 days of age were found to show increases in the seminal vesicle weight consistent with the dose after 48 hr., thus furnishing the basis for an assay procedure for androgens.

Relation of vitamin E to the effectiveness of testosterone injected into caponized male fowls, F. B. ADAMSTONE. (Univ. Ill.). (*Arch. Pathol.*, 31 (1941), No. 6, pp. 706-710, figs. 3).—A certain level of vitamin E in the diet seemed necessary for the most effective utilization of androgens by the capon method.² The comb growth of three capons receiving a normal ration or four capons on an E-deficient ration with supplements of synthetic E responded more rapidly to testosterone than others on a ration devoid of vitamin E.

Effect of testosterone propionate on bone growth and skeletal maturation of normal and castrated male rats, H. H. TURNER, E. LACHMANN, and A. A. HELBAUM (*Endocrinology*, 29 (1941), No. 3, pp. 425-429, figs. 3).—Prolonged injections of from 0.25 to 2 mg. of testosterone propionate per day to normal and castrated ♂ rats for from 16 to 135 days did not significantly alter the rate of skeletal maturation or body growth.

Use of anterior lobe of prostate gland in the assay of metakentrin, R. O. GREEP, H. B. VAN DYKE, and B. F. CHOW (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 644-649, fig. 1).—The enlargement of the anterior prostate of immature hypophysectomized rats induced by pituitary gonadotropins was

¹ Yale Jour. Biol. and Med., 10 (1937), No. 1, pp. 79-88, figs. 6.

² Jour. Morphol., 56 (1934), No. 2, pp. 339-359, pls. 3.

found in a series of experiments to serve as a quantitative measure of the metakentrin present (E. S. R., 84, p. 609).

Response of the preputial glands of the female mouse to testosterone propionate, H. O. BURDICK and E. GAMON (*Endocrinology*, 28 (1941), No. 4, pp. 677-679, fig. 1).—Daily injection of 2 mg. of testosterone propionate into normal ♀ mice caused increases in the weight per pair of preputial glands from the normal of 3.35 mg. to 65 mg. within 7 days, with similar increases in volume.

48-hour assay test for equine gonadotropin with results expressed in International Units, H. H. COLE and J. ERWAY. (Univ. Calif.). (*Endocrinology*, 29 (1941), No. 4, pp. 514-519, fig. 1).—Differences between ovarian weight responses of immature ♀ rats to varying doses of equine gonadotropin were as significant when determined 48 hr. after injection as at longer intervals up to 120 hr. A straight-line regression expressed the response of ovarian weight to single doses of equine gonadotropin from 4 to 20 I. U. The ovarian response was more reliable than the uterine response as a quantitative measure of the potency of equine gonadotropin.

The time and rate of appearance of gonadotrophin in the serum of pregnant mares, F. T. DAY and I. W. ROWLANDS (*Jour. Endocrinol.*, 2 (1940), No. 2, pp. 255-261, figs. 3).—Confirming the results of Cole (E. S. R., 80, p. 609) on blood samples collected from eight pregnant mares as to their ability to increase the weight of the ovaries of immature rats, it was concluded that the gonadotropic hormone appeared in the serum of these animals between 30 and 47 days after ovulation. The maximum concentration was reached between 60 and 75 days, but gonadotropin almost completely disappeared by 100 days. Withdrawal of as much as 10 percent of the blood did not alter the amount of gonadotropic hormone in the serum.

The inhibition of copper-induced ovulation in the rabbit by progesterone, M. H. FRIEDMAN. (U. S. D. A.). (*Endocrinology*, 29 (1941), No. 4, pp. 628-632).—A dose of from 1.6 to 2.4 mg. of copper injected into normal post-partum rabbits caused ovulation within 18 hr. in over 50 percent of the does injected. When the rabbits had received progesterone within several days the ovulatory response to copper was prevented, but not the ovarian response to gonadotropic extract from the juice of young oat plants (E. S. R., 86, p. 29).

Percutaneous administration of estrogens followed by progestin in inducing sexual receptivity in spayed guinea pigs, J. A. LEIGHTY, H. J. WICK, and B. E. JEFFRIES (*Endocrinology*, 28 (1941), No. 4, pp. 593-596).—Sexual receptivity was induced in the spayed guinea pigs previously employed (E. S. R., 83, p. 45) by the percutaneous application of oestrone and stilboestrol dissolved in cottonseed oil to the shaved necks of the animals, followed on the third day by progestin application. Stilboestrol was about half as effective as oestrone. More progestin was required for percutaneous administration than when it was given subcutaneously.

Quantitative effects of implantation of cattle anterior pituitary powder on gonads of immature rat, R. H. SHULER (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 537-540).—Studies of the weights of the uteri, ovaries, thymus, and testes of 22- to 24-day-old rats at 96 and 72 hr. after subcutaneous implantation with 25 mg. of pituitary powder from cattle on successive days showed that positive weight responses were obtained in the testes, ovaries, and uteri. Employing a total of 58 rats, the author found that the albinos were somewhat more responsive than the hybrids.

The mode of administration as an influence on the effectiveness of mare serum in hypophysectomized immature female rats, J. H. LEATHEM (*Endo-*

crinology, 28 (1941), No. 4, pp. 615-618).—Ovarian, uterine, and body weight changes in 73 immature hypophysectomized rats following the administration of 10 rat units of Gonadin (pregnant mare serum) in single and divided doses by subcutaneous, intraperitoneal, and intravenous methods at different intervals showed that a greater effect was produced from single doses by any method than from divided subcutaneous administration. The greatest effect on ovarian weight was produced by daily intraperitoneal injections. Sometimes corpora lutea were produced by intraperitoneal and intravenous injection, but not after subcutaneous administration.

Mating behavior induced in hypophysectomized female rats by injected estrogen, J. BALL (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, p. 669).—Subcutaneous injections of oestradiol benzoate (Progynon-B) on 5 successive days to three hypophysectomized ♀ rats caused them to exhibit heat behavior and to accept ♂s. Thus oestrogen does not induce heat behavior through the pituitary.

The development and morphology of the corpus luteum of the cat, A. B. DAWSON (*Anat. Rec.*, 79 (1941), No. 2, pp. 155-177, pls. 4).—The development of the corpus luteum in cats was paralleled by the postovulatory rise in the number of carmine acidophiles of the anterior pituitary gland. When the endometrium gives histological and physiological evidence of the influence of progesterone (2-5 days postcoitum), the granulosa cells have not been completely transformed into definitive luteal cells. The transformation is complete at 7 days, when fertilized ova enter the uterus, and the corpora lutea reach maximum size at the time of implantation (13-14 days). The results are based on histological study of both ovaries and the uteri of 40 pregnant cats.

Further investigations on artificial insemination of cattle, J. ANDERSON (*Jour. Agr. Sci. [England]*, 31 (1941), No. 3, pp. 348-353).—Employing methods of artificial insemination previously described (E. S. R., 78, p. 612), the author found in studies in Kenya that of 733 grade cows inseminated 76.8 percent calved, with an average of 1.88 inseminations per conception. Similar results were obtained with different dilutions and frequency of insemination.

Further investigations on artificial insemination of sheep, J. ANDERSON (*Jour. Agr. Sci. [England]*, 31 (1941), No. 3, pp. 354-369).—Lambing percentages from inseminations by the methods noted above were found to be from 50 to 65 percent among over 6,000 grade ewes bred to purebred rams. In these studies there was a distinct correlation between the percentage of ewes that lambed and the duration of the cycle. Consideration was also given to the season of the year and duration of oestrus, number of inseminations, dilution of sperm, and fertility of the ram.

Rate of sperm travel and time of ovulation in sheep, R. G. SCHOTT and R. W. PHILLIPS. (U. S. D. A.). (*Anat. Rec.*, 79 (1941), No. 4, pp. 531-540, fig. 1).—In the genital tracts of ewes of several breeds slaughtered at intervals after breeding, sperm were found to travel at the rate of 4 cm. per minute regardless of the stage of the oestrous cycle. A time interval of 20 min. was usually sufficient for sperm to reach the upper part of the Fallopian tube. Ovulation generally occurred at from 20 to 36 hr. after the onset of heat, but Corriedale and Dorset ewes tended to remain in heat after ovulation. The data were based on determinations of the presence of sperm in different sections of the uterus and Fallopian tubes of 72 ewes slaughtered at varying intervals after breeding and examination of the stage of follicle and corpus luteum development in 63 of the ewes in this group.

Effectiveness of heme in the augmentation of gonadotropic extracts from different sources, W. H. McSHAN and R. K. MEYER. (Univ. Wis.). (*En-*

docrinology, 28 (1941), No. 5, pp. 694-700).—Heme augmented several times the gonadotropic action of sheep, hog, cow, and human pituitary extracts, as determined by the ovarian weights of 21-day-old rats, but it did not augment the action of horse pituitary gland hormones, pregnant mare serum, or pregnancy urine extract.

Effect of increasing the number of daily injections of gonadotropic preparations on the ovaries of immature rats, R. K. MEYER and W. H. MCSHAN. (Univ. Wis.). (*Endocrinology*, 29 (1941), No. 1, pp. 31-34).—The ovarian weights of immature ♀ rats injected with sheep and cattle pituitary extracts were found to depend on the amount given and the number of injections per day. When 50 mg. of sheep and 300 mg. of cattle extracts were given twice per day the ovarian weights were, respectively, 17 and 10 mg., but when the same amounts were given 24 times per day the weights were 105 and 199 mg. Extracts of horse pituitary, human pregnancy urine, and pregnant mare serum were not more effective when the number of injections was increased. Greater effectiveness was obtained from more frequent doses of follicle-stimulating hormone from sheep. These augmentative effects were similar to those found for heme, noted above, which is found to maintain a constant amount of hormone in the blood.

The effect of refeeding and of the administration of a pituitary extract on the ovaries of undernourished guinea pigs, D. J. STEPHENS and W. M. ALLEN (*Endocrinology*, 28 (1941), No. 4, pp. 580-584, figs. 4).—Underfeeding, causing from 20 to 30 percent loss in body weight in mature ♀ guinea pigs in 2 weeks, produced atrophic changes in the ovary similar to those experienced with hypophysectomy. These changes were not affected by vitamin supplements, but normal ovarian structure was restored by refeeding. The ovaries were responsive to the gonadotropic principles of the anterior pituitary.

Sex difference in growth in gonadectomized albino rats, Y. Z. TANG (*Anat. Rec.*, 80 (1941), No. 1, pp. 13-32, figs. 3).—Castrated ♂ rats were found to grow at a slower rate to 10 weeks of age than normal ♂s, while spayed ♀s grew at a faster rate than normal ♀s but not as rapidly as castrated ♂s. These results were obtained from growth records of 75 ♂ and ♀ mice from 10 litters. Some were gonadectomized soon after birth, some at 2 weeks, and some at 45 days of age. Feed consumption was reduced by the operation, but feed efficiency was reduced 7 percent by castration and increased 31 percent by spaying. At the conclusion of the test the rats were autopsied, and the differences in the size of the various organs and tissues were noted. Differences in the skeletal development were much as for live weight.

Effects of hypophysectomy and replacement therapy on the thyroid and adrenal glands of the male ground squirrel, M. ZALESKY, L. J. WELLS, M. D. OVERHOLSER, and E. T. GOMEZ. (Univ. Minn. and Mo. et al.). (*Endocrinology*, 28 (1941), No. 4, pp. 521-530, figs. 4).—Following hypophysectomy of ground squirrels (E. S. R., 79, p. 39) there was a reduction in the body, thyroid, and adrenal weights, which were partially restored by certain of the gonadotropic hormones.

Autoplastic grafting of the anterior pituitary in male rats, E. CUTLY (*Anat. Rec.*, 80 (1941), No. 1, pp. 83-97, pls. 2).—Data are presented on the condition of the glands and motility of the spermatozoa of six hypophysectomized ♂ rats with autoplastic ocular and four with sellar grafts. In six animals the ocular grafts were nonfunctional. One rat had two fertile matings more than 200 days after ocular transplantation, and another had fertile matings 209 days after sellar transplantation of part of the anterior hypophysis. Sellar grafts appeared more normal histologically than ocular grafts, but histological aspects of ocular grafts were not necessarily correlated with functional activity.

Treatment of successive generations of rats with thymus extract (Hanson) and related substances, A. SEGALOFF and W. O. NELSON (*Endocrinology*, 29 (1941), No. 4, pp. 483-491, figs. 5).—It was not possible to produce any regular acceleration in rate of growth in body size, length, or development through daily injection of thymus extract, glutathione, or glutathione-ascorbic acid into rats for four, five, or six generations. The occurrence of the first oestrus was slightly delayed as contrasted with the controls.

A strain difference in responsiveness of chick thyroids to thyrotropin and a step-wise increase during three years in thyroid weights of Carneau pigeons, R. W. BATES, O. RIDDLE, and E. L. LAHR (*Endocrinology*, 29 (1941), No. 4, pp. 492-497, figs. 3).—The thyroid weights in 862 pigeons at 7 weeks of age increased from an average of 40 mg. in those born in 1936 and 1937 to 179 mg. for those hatched in early 1941. These changes with seasonal differences in thyroid weight in the White Carneau pigeon make the strain unsuitable for bio-assay of thyrotropin. When the dose was plotted against the thyroid weight in 5 days, it required four times as much thyrotropin to produce the same effect in one strain as in the other. However, the same slope was found for chicks of both strains. No differences were found in the responsiveness of the testis to thyrotropin or of the adrenals to adrenotropin.

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), Nos. 10, pp. 1, 2, 7, fig. 1; 11, pp. 3, 4, 5, 7).—Results of experiments with field crops are reported in articles entitled:

No. 10.—Best Cultivation Is Shallow, Every Ten Days, Two Weeks, by O. A. Leonard (pp. 1, 2, 7); Good Planting Seed Prerequisite to Good Oat Yield, by J. F. O'Kelly (p. 1); and Dairymen Have Major Interest in Program To Increase Oat Crop, by J. S. Moore (p. 2).

No. 11.—Delta Tests of Cotton Varieties, by H. C. McNamara (p. 7). This number also includes (pp. 3, 4, 5) brief reports by C. Dorman on variety tests with cotton, oats, soybeans, corn hybrids, lespedeza, potatoes, sweetpotatoes, and miscellaneous hay crops; cultural tests with soybeans, cowpeas, cotton, and sweetpotatoes; a storage test with potato varieties; fertilizer experiments with sweetpotatoes and pasture; other pasture studies; trials of castorbean and Alyceclover; and on control of nutgrass by cultivation and chemicals.

Fertilizer investigations in Montana in 1940, A. H. Post (*Montana Sta. Bul.* 395 (1941), pp. 17, figs. 4).—Fertilizer experiments with wheat, hay meadows, alfalfa, and sugar beets were conducted in 1904 in different localities.

Wheat did not respond on all fields to phosphate fertilizer, although certain soils returned increased yields of wheat when treated with treble superphosphate and ammoniated phosphate. On spring wheat the lighter applications were as effective as the heavier ones. Alfalfa showed a residual effect of phosphates, i. e., the yield of second cutting alfalfa 3 yr. after phosphate application was 106.7 percent above the check. Hay yields in 1940 on several meadows in Beaverhead County treated with phosphate in the fall of 1939 indicated that most soils in question were not deficient in phosphate for the crops studied. Application of phosphate, however, increased the P content of the forage.

Maximum yields of sugar beets at Billings required phosphate and manure. On unmanured land 100 lb. of treble superphosphate was as effective as heavier applications while on manured land 200 lb. was best. The highest beet yields in this test were produced after treatment with a mixture of treble superphosphate 100 lb., ammonium sulfate 100, and boric acid 10 lb. At Corvallis,

a combination of treble superphosphate 100 lb., ammonium sulfate 100, and potassium chloride 50 lb. per acre gave the highest yields of sugar beets. At Sidney, commercial fertilizers were as effective as manure in increasing sugar beet yields but their combination did not surpass either one alone.

Pasture improvement and management, D. B. JOHNSTONE-WALLACE ([*New York*] *Cornell Sta. Bul.* 755 (1941), pp. 31-44, figs. 8).—The pastures of Suffolk and Nassau Counties, Long Island, N. Y., are discussed as to common grasses and legumes, fertility needs and ways to supply them, grazing management, establishing new pastures, seed mixtures for permanent pastures and meadows for hay or silage, use of selected varieties of legumes and grasses, and pastures for poultry.

A botanical and yield study of pasture mixtures at Beltsville, Maryland, P. R. HENSON and M. A. HEIN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 700-708).—A series of eight pasture mixtures comprising various grass species in association with Louisiana white clover were tested 1937-40. Rapid decline of the percentage of white clover through the early years of the experiment indicated its inability to compete with grasses under close cutting. Kentucky bluegrass predominated at the end of the second year after seeding in all mixtures including it, and made up over 90 percent of the total grass population in these mixtures the fourth year. The percentages of orchard grass, timothy, and redbud decreased to the fourth year when the amounts of these species were small and affected the herbage yield very little. Timothy was the least persistent. The more complex seed mixtures increased the herbage yield significantly only during April, May, and June of the first year after sowing. Production during July and August was not increased regardless of the complexity of the mixture.

Tame pastures in Kansas, K. L. ANDERSON (*Kansas Sta. Cir.* 206 (1941), pp. 28, figs. 5).—Practical information, based on station research and experience, is given on the economy of pastures, tame perennial grasses and legumes, pasture mixtures, establishment and management practices, and the use of cereal grains, Sudan grass, Korean lespedeza, and rape for pasture.

A comparison of the ocular-estimate-by-plot and the stubble-height methods of determining percentage utilization of range grasses, E. H. REID and G. D. PICKFORD. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 11, pp. 935-941, fig. 1).—Both methods have given about the same estimates of the degree of utilization when the height of stubble after grazing is quite uniform, but when grazing is ragged or uneven on individual grass clumps the stubble-height method tends to give low estimates. The plats needed to sample utilization number about the same (30) for both methods. The simplicity of the ocular-estimate method (E. S. R., 77, p. 616) makes it the more suitable for field use, and recommends it as the best available inspection method of determining degree of use on large range areas.

Re-establishing native grasses by the hay method, L. E. WENGER. (Coop. U. S. D. A.). (*Kansas Sta. Cir.* 208 (1941), pp. 16, figs. 7).—Spreading mature hay of native grasses on a shallow-tilled seedbed with a manure spreader and packing it in with a subsurface packer was shown to be a practical way to revegetate areas in sections of Kansas where native grass pastures will provide seed material. Practices essential to success include the protection of native pasture from grazing for at least 75 days before the normal date of seed maturity, for most grasses during September; mowing at an optimum stage of maturity, raking and stacking immediately; and spreading after at least one winter in the stack late in April or during May on firm fallow or disked stubble land with the common species except western wheatgrass, which should

be spread in the fall or early spring. The mature hay harvested from 1 acre of protected native pasture over 1 to 3 acres of cultivated land varying with conditions represents the normal planting range. Weeds should be clipped at intervals during the first summer. If rainfall conditions permit, grazing may usually be practiced after the middle of the second season. The method is not well suited to reclaiming large areas of submarginal land in southwestern Kansas requiring transportation of the hay material for long distances.

A comparison of grasses for athletic fields and the effect on the turf of peat incorporated with the soil, J. A. DEFRANCE. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 433-438).—The most desirable turf for an athletic field on which fall play is very heavy was developed from a mixture including Chewings fescue, 2 lb.; Kentucky bluegrass, 1 lb.; Colonial bent, 1 lb.; and Pacey perennial ryegrass, 2 lb. per 1,000 sq. ft. Colonial bents germinated and produced a stand quite rapidly and were permanent, while Pacey perennial ryegrass and redtop have not persisted. Under playing field conditions in the fall, creeping forms of Colonial bent and velvet bent seeded alone developed inferior turf compared to mixtures containing them and produced brown, fluffy, and matted turf, especially after frost and heavy athletic traffic. Rhode Island Colonial appeared to be the most desirable form of bentgrass. Piper velvet bent on a baseball diamond maintained at 0.5-in. height and occasionally top-dressed has been very satisfactory. Fescues used alone were inferior to mixtures containing them and were better on plats having peat incorporated with the soil. Fescues with Kentucky bluegrass and Colonial bent improved the resultant mixtures in increasing wear resistance. Kentucky bluegrass appeared very aggressive and had a dark green color, especially in the fall when fescues and Colonial bents usually lacked color. Incorporation of peat in the soil appeared advantageous.

Lawn grasses for south, D. C. STURKIE. (Ala. Expt. Sta.). (*Amer. Nurseryman*, 74 (1941), No. 5, p. 13).—The merits of centipede grass and *Zoysia matrella* are described in comparison with Bermuda and other lawngrasses.

Frost injury to cereals in the heading stage, C. A. SUNESON. (U. S. D. A. coop. Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 829-834, figs. 2).—That a practical limit in earliness has been reached in California with the wheat variety Ramona was suggested by frequent instances of frost damage at the critical heading stage. Differences in spike or glume desiccation and in differential flower part resistance to frost injury were observed among early varieties of wheat and barley grown experimentally. Breeding for protection against frost damage seemed impracticable, however, because the spread in cold tolerance appears to be limited to temperature differences of only 2° or 3° F. Frost damage to the staminate flower parts does not appear to increase natural crossing appreciably.

The grain inspection laboratory: Twenty-five years' service to Montana, W. O. WHITCOMB (*Montana Sta. Bul.* 396 (1941), pp. 19, figs. 7).—The activities and services of the Montana Grain Inspection Laboratory since it began operation on October 1, 1913, in seed testing and inspection, grain inspection and grading, and protein testing are reviewed, and pertinent comments are made on the development of scientific grain and seed testing, grain standards, and protein and milling and baking tests. A list of 90 publications of the laboratory is appended.

Seed of new wilt-resistant winter hardy alfalfa to be increased for general distribution, J. W. CARLSON. (U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, pp. 1, 11, fig. 1).—Methods and problems involved in the increase of improved alfalfa stocks are described briefly.

Artificially induced vivipary in barley, M. N. POPE. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 850-851).—In Manchuria and Hannchen common barleys growing in the greenhouse at Arlington, Va., germination of very immature seeds while still attached to the growing plant could be obtained by affording an abundant supply of water to the caryopsis directly over the embryo. Of 16 seedlings from treated seeds, only an albino failed to produce normal plants. This method made it possible to secure transplantable seedlings in 15-20 days after flowering and should be useful in speeding operations in a breeding program.

Tift Bermudagrass, *Cynodon dactylon* (L.) Pers., J. L. STEPHENS. (U. S. D. A. and Ga. Coastal Plain Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 942-943).—Tift Bermuda grass, found in 1929 near Tifton, Ga., and apparently an unusual strain originating from common Bermuda grass, is characterized by rapidity of growth, hardiness, and heavy vegetative yield, and is promising as a hay producer. As a grazing plant, it surpasses common Bermuda grass in carrying capacity and uniformity of grazing produced throughout the season.

Pasture studies of brome grass, *Bromus inermis* Leyss., R. F. FUELLEMAN and W. L. BURLISON. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 883-892).—Sown as about 40 percent of the pasture mixture in 1933, smooth brome grass persisted to a marked degree up to 1940 and showed indications of continuing as a dominant species in the turf. Botanical analyses in the late fall of 1940 showed that it made up 50 percent of the vegetation. Yields and consumption fluctuated with seasonal conditions but were uniformly high when compared with other grasses. Pasture days and animal gains have been uniformly high in all seasons. Small residual yields on final seasonal sampling dates indicated the slow recovery of brome grass following seasonal grazing. Approximately 90 percent of the total growth has occurred before August 1, and indications are that brome grass is drought resistant and also drought escaping. Related pasture investigations have been noted (E. S. R., 83, p. 763).

The effect of tillers in corn upon the development of the main stalk, C. E. ROSENQUIST. (Univ. Nebr.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 915-917).—When tillers of dent corn plants were covered with burlap to exclude light and prevent photosynthesis, main stalks and tillers developed poorly, and treated plants weighed only half as much as untreated adjacent plants. Under such conditions tillers depended upon the main stalk for subsistence, and as a consequence dry weights of main stalks and tillers were reduced greatly. When tillers were removed early, main stalks produced about 10 percent less dry matter than those of untreated plants. Removal of leaves from tillers forced them to become almost wholly dependent upon the main stalk. The weight of the main stalk and its ear size were materially increased by removing ear-shoots from tillers at time of silking. Under the conditions of wide spacing necessary, removing or defoliating tillers reduced the total weight of the plant at least 50 percent and the ear yield more than 40 percent. See also an earlier note by Dungan (E. S. R., 66, p. 823).

Correlation of total dry matter with grain yield in maize, J. SHAFER, JR., and R. G. WIGGANS. (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 927-932, figs. 2).—Correlation between the weight of total dry matter produced and weight of dry shelled grain was demonstrated by data obtained in a silage corn breeding program. Single crosses, double crosses, and top crosses were investigated, and most of the populations studied involved 100 or more different crosses. The coefficients were definitely significant for all of

the larger populations; r varied from 0.60 to 0.85. For a preliminary test in a silage corn breeding program, a "grain test" might be useful.

Some factors that influence the immediate effects of pollen on boll characters in cotton, H. J. FULTON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 8, pp. 469-480).—Cotton strains inbred from 11 to 20 yr. or longer were used to test immediate effects of pollen on boll characters. Emasculated flowers of Acala cotton were pollinated with Pima, Acala, and Hopi pollen. Significant differences among means for the several cross-pollinations were obtained in number of seeds per boll, in seed index, in lint index, in fiber length, and in boll maturation period. Effects upon the expression of these characters by differences between different years, different days of anthesis in the same year, different individual plants used as pistillate parents, and variation in conditions affecting the nutrition of the bolls were shown to be so great as conceivably to mask completely the effects of different pollens.

The influence of any internal genetic change in a standard variety of cotton upon fiber length, J. H. MOORE. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 679-683, fig. 1).—Mass-selfed and open-pollinated progenies of a Mexican strain of American upland cotton were planted for 3 successive years on a field that had grown only Mexican strains. No change was noted in combed fiber length or in its variability or in plant type or seed after 1, 2, or 3 yr. of mass-selfing or open-pollination. Arrays on the Baer sorter showed no real differences in fiber-length distribution of ginned staple at the end of four seasons in a comparison of the two kinds of seed stocks with the original seed. Where contamination of seed is avoided, varieties registered or eligible for registration apparently do not run out as measured by fiber length.

Cotton from boll to bale, F. L. GERDES, W. J. MARTIN, and C. A. BENNETT (U. S. Dept. Agr. Leaflet 211 (1941), pp. II+6, figs. 3).—The harvesting and handling practices described, considered essential in producing maximum values of ginned lint and seed, include picking dry or drying after picking, picking clean and before undue field exposure, keeping separate (or thoroughly mixing) seed cotton of unlike quality, bringing in loads of seed cotton to produce bales weighing about 500 lb., use of modern gin equipment, and careful handling and storage of baled cotton.

Cold tolerance in flax, A. C. DILLMAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 787-799, figs. 5).—The cold tolerance of flax varieties fall sown at Arlington, Va., was tested during three winters. Roman Winter, Rio, Rigor, and Bolley Golden, the most hardy, have a branched spreading habit of growth when fall sown, whereas the less hardy Redwing, Bison, and fiber flaxes grow erect with few or no basal branches as they do when spring sown. In two winters, plants 2-4 in. high at time of severe freezing (9°-12° F.) were not injured greatly, whereas taller plants of the earlier plantings were frozen back to crown buds. In 1940-41, the younger plants survived largely until mid-January, whereas older plants perished earlier. In 1938-39, however, the larger plants, protected somewhat by fallen tree leaves, were still alive at the crown after younger plants had died. In general, the younger tissues and leaves of the terminal buds were hardier than older leaves on the stem. A selection of a single survivor from a row of a tender variety proved remarkably resistant to cold. Progenies of crosses of hardy Roman Winter with Rio and Rigor contained plants in the F_4 that appeared to be as hardy as those of Roman Winter. Cold tolerance and wilt resistance were not consistently related.

The nitrogen content of *Poa pratensis*—its range and relation to flowering date, J. T. SULLIVAN and R. J. GARBER. (U. S. D. A.). (*Jour. Amer. Soc.*

Agron., 33 (1941), No. 10, pp. 933-937).—Data are presented on the range in composition of Kentucky bluegrass plants and the association of date of flowering of an individual plant with its N content during flowering and at nonreproductive periods of growth. Late-flowering plants were higher in N than plants blooming only a few days earlier when studied during flowering, several months later in the aftermath stage, and when clonal isolations were grown in the greenhouse. Within one group of plants, studied 2 yr. on different plats, a small significant correlation ($r=+0.287$) was found for N content for the 2 yr. A small significant correlation ($r=+0.488$) was found between N content in the greenhouse and field for 32 clones representing extremes of flowering dates and composition in the field. A negative correlation ($r=-0.906$) between N content and yield of 32 clones in the greenhouse was highly significant.

Apetalous and petaliferous flowers in Lespedeza, R. MCKEE and H. L. HYLAND. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 811-815, figs. 3).—In *L. cuneata*, *L. inschanica*, and *L. cystoides*, seed from the two kinds of flowers, as indicated by the shape of pod, produced similar plants. In *L. latissima* the plants were dissimilar in amount and manner of growth. In some instances the number of petaliferous flowers vary from year to year. Length of day or amount of light available during the flowering season may be a determining factor, for in the greenhouse during winter under the shorter days only apetalous flowers are produced, while under longer days with artificial light some petaliferous flowers are formed. In all species observed pods from petaliferous flowers were larger and more acute than those from apetalous flowers and had the style persisting as a setaceous point. Pods from apetalous flowers were comparatively blunt or rounded at the tip. Of five species in the Eulespedeza section for which data were secured, *L. daurica* and *L. inschanica* produced more seed from petaliferous than from apetalous flowers. In *L. cystoides*, *L. cuneata*, and *L. latissima* most of the seed was produced from apetalous flowers.

Preliminary results with mulches applied to eroded wasteland sown to lespedeza, B. H. HENDRICKSON and R. B. CROWLEY. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 690-694).—Mulching with small grain straw and with lespedeza straw from annual (Korean and Kobe) lespedeza seedlings on thin, steep, clay-gall lands of the Cecil series, fertilized with superphosphate or basic slag, gave beneficial effects on stands, growth, lespedeza yields, and reduction of soil and water losses. A plan of growing mulches in place or of self-mulching cropping practices for the better cropland was suggested by the results.

The relation of tannin content of sericea lespedeza to season, R. E. STITT and I. D. CLARKE. (U. S. D. A. coop. N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 739-742).—When sericea lespedeza (*Lespedeza cuneata*) was sampled fortnightly from May 5 to October 20, 1936, at Statesville, N. C., from a field sown in 1931, leafiness decreased through the season. Tannin in leaves rose until June 30, then gradually decreased until September 22. Leaf samples obtained in October, partly because of mature seed in them, were appreciably lower in tannin than the September samples. The first and last leaf samples collected contained less than half as much tannin as midseason samples. All stem samples were low in tannin.

Cultural methods for growing peanuts, U. R. GORE (*Georgia Sta. Cir.* 131 (1941), pp. 4, fig. 1).—Production practices recommended from results of station experiments and experience of successful growers of peanuts include soils and their preparation; varieties; choice, treatment, and planting of seed; fertilizer; cultivation; harvesting; and rotation.

Mineral nutrient extraction and distribution in the peanut plant, L. BURKHART and N. R. PAGE. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 743-755, figs. 4).—The concentration of mineral nutrients in fresh tissues of the peanut plant as an index of soil fertility and fertilizer needs of the crop was studied in material obtained from nine fertilizer experiments on six soil types in the Coastal Plain region of North Carolina. Extraction of plant tissue with boiling water for 2 hr. sufficed to remove the minerals considered, i. e., K, Ca, Mg, PO₄, and SO₄. The soluble mineral nutrient distribution in the plant is shown graphically for leaf blades, petioles, and stems, separated into top, middle, and lower portions at vegetative, early fruiting, and maturity growth stages. In the vegetative stage, the lower blades could be used in foliar diagnosis as a criterion in making proper fertilizer side applications, with particular reference to Ca, K, and Mg. A relation exists between mineral nutrient concentration in the lower leaf blades of the peanut plant and fertilizer treatment and yield response.

Seed-setting in potatoes as affected by spraying with α -naphthaleneacetamide and by light, A. E. CLARKE, W. C. EDMUNDSON, and P. M. LOMBARD. (U. S. D. A.). (*Amer. Potato Jour.*, 18 (1941), No. 10, pp. 273-279).—Potato plants sprayed with dilute concentrations of α -naphthaleneacetamide did not produce more flowers or seed balls in greenhouses at Beltsville, Md., or Greeley, Colo., and higher concentrations reduced flower production at Presque Isle, Maine. Sebago and Irish Cobbler produced more seed balls at Greeley than at Beltsville, probably because of less cloudy weather at Greeley during winter. S 245-25, when self-pollinated, has produced as many seed balls at Beltsville as at Greeley; apparently it flowers and sets seed more readily under fairly unfavorable light than either Sebago or Irish Cobbler.

The problem of maintaining a silt loam suitably porous for potatoes, J. BUSHNELL. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 26 (1941), pp. 63-68).—Rye, sown in August, has been the best winter cover crop to precede potatoes on Wooster silt loam, which does not form a crumb structure. Its special value seemed due to the mass of fine roots produced during the fall, which retains the porosity induced by wetting and freezing the soil in winter, and spring rains do not recompact the soil under rye. Winter barley or mammoth clover might prove as good as or better than rye.

Exploratory tests of subsoil treatments inducing deeper rooting of potatoes on Wooster silt loam, J. BUSHNELL. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 823-828, figs. 2).—Addition of P and N carriers, by a special technic, to the subsurface soil increased the quantity of potato roots, but did not increase consistently the yield of tubers. The normal shallow rooting in this soil is attributed to lack of available N and P in the subsoil.

Relation of leaf area to grain yield in sorghum, A. F. SWANSON. (Kans. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 908-914).—Leaf area per stalk of five grain sorghum varieties differing in maturity, height, and size and number of leaves was measured, 1929-33. The total leaf area per acre ranged from about 21,000 to more than 190,000 sq. ft., averaging for Dwarf Freed 58,347, Modoc 68,624, Custer 85,399, Kalo 81,502, and Dwarf Yellow milo 120,500 sq. ft. Their respective average acre grain yields were 34.2, 40.4, 35.5, 54.3, and 42 bu. The average leaf area per stalk ranged from about 0.64 to 5.742 sq. ft., depending on variety and season. The production of 1 bu. of grain required approximately from 4,000 to 11,400 leaves, having a total area of 570-3,800 sq. ft. For each leaf per stalk functioning during the fruiting period, the grain yield was from 3.5 to 6 bu. per acre. Abundant rainfall during the vegetative period stimulated leaf development. Less leaf area was required

to produce a bushel of grain in a dry year than in a wet year, yet the highest yields were obtained in seasons with abundant rainfall.

Asexual propagation of sugar beets, F. V. OWEN. (U. S. D. A.). (*Jour. Hered.*, 32 (1941), No. 6, 187-192, figs. 4).—Methods used extensively in the vegetative propagation of sugar beets by the U. S. D. A. Sugar Plant Laboratory, Salt Lake City, Utah, are described and illustrated.

Sucrose loss and changes of nitrogen constituents in sugar beets under conditions of delayed topping, C. PRICE, J. M. FIFE, G. E. GILLESPIE, and W. C. FERGUSON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 901-907, figs. 3).—Field experiments at Chino and King City, Calif., 1936-38, supplemented by chemical analysis in which 0-7 days elapsed between lifting and topping sugar beets, demonstrated that for California conditions the practice of lifting sugar beets several days before topping results in a loss in sugar production. This is due to a direct loss in the field, and also to increase in harmful N which would interfere with recovery of sugar in processing.

The Puerto Rico Sugar Manual, A. B. GILMORE (*New Orleans: A. B. Gilmore, 1941, pp. 286, figs. 81*).—Information is given on the ownership, equipment, agricultural practices, and sugar production for sugar companies in Puerto Rico, Santo Domingo, Haiti, and the Virgin Islands. Papers on phases of the sugarcane industry presented at recent meetings of sugar technologists in Puerto Rico, Cuba, Louisiana, and Hawaii are included, together with special contributions by Puerto Rican field and mill operators. A feature article is entitled Sugar Cane Research Conducted at the Agricultural Experiment Station of the University of Puerto Rico, by J. A. B. Nolla (pp. 6-9) (P. R. Univ. Expt. Sta.).

Objectives in breeding for improved quality in hard wheat, W. F. GEDDES. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 490-503).—The industrial quality of hard wheats depends upon their milling quality and the value of the flour for bread-making purposes. Good milling quality requires that kernels be plump, uniformly large, absorb water readily and uniformly in tempering, and produce a high yield of flour low in yellow pigment and ash content with a maximum and clean separation from bran and germ. Good baking quality involves production of satisfactory bread over a range of baking conditions and includes the facility with which dough can be handled in the bakery and the bread yield. A new wheat variety should yield a flour well balanced in the several attributes of quality. Where present types are satisfactory in quality, breeders should endeavor to produce new varieties with desired agronomic characteristics which resemble the superior present varieties in grading, milling, and baking characteristics. Scientific and technological advances may change quality requirements or introduce new factors, and close contact with the milling and baking industry is essential.

Yields of varieties of wheat derived by backcrossing, C. A. SUNESON, O. C. RIDDLE, and F. N. BRIGGS. (U. S. D. A. coop. Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 835-840).—The wheat varieties, Baart 38 and White Federation 38, resistant to stem rust and bunt but otherwise very similar to Baart and White Federation, the recurring parents, were produced by backcrossing. In limited tests under stem rust epidemic conditions these new wheats materially outyielded their counterparts, and commercial fields produced normal yields in the severe epidemic of 1940, whereas in some cases adjacent fields of Baart and White Federation were damaged too badly for harvest. In numerous trials in which neither stem rust nor bunt affected yields, significant differences were not observed between the new varieties and their respective parents.

A new wheat variety resistant to smut, rust, and mildew developed at station, D. C. TINGEY. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, p. 12).—A new spring wheat developed from a hybrid between Hope and Federation seems to have inherited most of the good qualities of both parents, but resembles Federation in general characteristics. It out-yielded Federation, 1938-41, by an average of 11.6 bu.

Green seeds in immature small grains and their relation to germination, A. T. BARTEL. (U. S. D. A. coop. Ariz. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 732-738, fig. 1).—Green seeds found in wheat and barley heads, collected from 12 to 24 days after flowering, when stored for at least 6 mo. before germination tests, in general germinated poorly and produced relatively weak, slow-growing seedlings. Their occurrence appeared due largely to the way collections were taken and exposure to sunlight during drying. Plants pulled with soil adhering to roots yielded mostly white kernels regardless of exposure during drying, whereas spikes cut from comparable plants at the same time produced 47 percent of green seed when dried in direct sunlight and 3 percent when dried in the shade. The method of collecting and drying plants before maturity seemed to merit consideration, especially if seeds are to be used for propagation or genetic studies.

[Seed and weed studies] (*New York State Sta. Rpt. 1941*, pp. 50-52).—The general merits and characteristics of official samples of field crops, vegetable, flower, tree, and shrub seeds, and special seed mixtures; control field plantings of seed stocks; and the weed problem in connection with seed stocks and harvesting practices are reported on briefly.

Weed Manual, Bureau of Reclamation (*Washington: Fed. Security Agency, Civ. Conserv. Corps*, [1941], pp. [1]+I+XVI+158, pls. 4).—A compilation of information is presented on weed control for reference use by CCC supervisory personnel and enrollees, with special application to weed problems of western States, particularly in irrigated areas. It deals with the history of weeds, their habits, current methods of control and eradication, and how Bureau of Reclamation CCC camps may contribute to the weed control programs on the Federal irrigation projects. A comprehensive bibliography is included.

Effect of ensiling on the viability of weed seeds, J. W. ZAHNLEY and J. B. FITCH. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 9, pp. 816-822, figs. 2).—Five sets of 100 seeds each of 11 species of weeds were placed in silage in different silos and at different locations in silos for periods from 33 to 1,636 days, 1927-33. Five species showed some germination after storage in the silo. Field bindweed germinated in 6 yr., while annual morning-glory and velvetleaf germinated in 5 yr. Field bindweed made an average germination of 16 percent after passing through the silo compared with 27 percent when stored outside exposed to weather, while velvetleaf germinated higher after storage in the silo than when stored outside. Three species totaling 28 seeds germinated after about 4.5 yr. in the silo. Viability of rough pigweed, yellow foxtail, Johnson grass, smartweed, sunflower, and cocklebur apparently was destroyed in the silo, but seed of field bindweed, velvetleaf, morning-glory, giant ragweed, and barnyard grass seemed able to resist the effects of ensiling. The danger of spreading certain species of weeds by corn and sorghum silage crops evidently is reduced but not eliminated by ensiling the crop.

Results of bindweed control experiments at the Fort Hays Branch Station, Hays, Kansas, 1935 to 1940, F. L. TIMMONS. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 296* (1941), pp. 50, figs. 9).—Experiments on control of bindweed (*Convolvulus arvensis*) by cultivation, competitive crops, and chemical treatments are reported with practical recommendations.

Grain and forage yields of nine field crops were reduced from 20 to nearly 90 percent by bindweed competition. Yields of small grains were affected less than those of sorghums and other summer-growing crops.

Intensive fallow usually eliminated bindweed in two seasons or less and was more dependable and much cheaper than eradication by chemicals. Cultivation 12 days after each first emergence eliminated bindweed with 16½ (average) operations compared with 33 cultivations just after emergence, formerly a common practice. Cultivation every 2 weeks during the first 3 or 4 mo. of treatment or until bindweed has weakened and emerges more slowly, after which the interval may be lengthened safely to 3 weeks, seems practicable. The best times to begin cultivation appeared to be in spring soon after bindweed growth started and after small grain harvest as soon as enough soil moisture was present for bindweed growth and thorough tillage. The optimum depth of cultivation in the medium heavy soil at Hays was 4 in. Hoeing every 10 days to 2 weeks eradicated bindweed as quickly as other cultivation and appears good for use in cities and on small patches hard to reach with field machinery.

One yr. of intensive fallow and three crops of wheat sown in early October each year after intensive cultivation between harvest and seeding was a practicable way to eradicate bindweed in from 3 to 4 yr., and alternate fallow and wheat and a rotation of fallow 1 yr. and wheat 2 yr. also appeared to be good methods. Close-drilled sorgo planted about July 1 after 1.5 yr. of intensive cultivation eliminated bindweed in 2 yr. Sorgo drilled each year about July 1 after thorough cultivation from about May 1 to planting required 1 or 2 yr. longer for eradication and tended to produce lower forage yields, but appeared excellent for use where soil moisture is plentiful. Sudan grass (but not millet) was nearly as effective as sorgo under both methods.

Sodium chlorate was the best chemical for general use, but cost of treatment, averaging about 10 times that of intensive cultivation, and undesirable residual effects restrict its use largely to small patches and to uncultivated areas. Results were about the same whether sodium chlorate was applied dry (considered safer and cheaper) or as a spray solution. From 3 to 4 lb. per square rod in first applications, preferably in September or October, have, in general, given most economical results on upland, although from 4 to 5 lb. may be used on bottom land or on unusually fertile soils. Enough chlorate should be used at first application to kill from 90 to 95 percent of the bindweed and followed up after a year or later with necessary amounts. Retreatment was best made when surviving bindweed began to recover from the original application. No advantage came from cultivating dry sodium chlorate into the soil except shallow cultivation to prevent shifting of the chemical by wind or run-off water on steep slopes or bare areas. Close-drilled sorgo and Sudan grass, best crops for chlorate-treated land, were followed in order of decreasing tolerance to chlorate in the soil by milo, corn, kafir, oats, rye, sweetclover, barley, and wheat. Both wheat and sorghum, continuous or in rotation with fallow, effectively prevented reinfestation by bindweed seedlings which emerge for at least from 5 to 8 yr. after eradication) where good crop stands were obtained and cultivation was adequate to destroy all annual weeds once a month in intertilled crop and between harvest and seeding.

Common salt, 1 lb. per square foot, has eradicated bindweed, but should be used only on areas where soil sterility is desirable or where sodium chlorate is a fire hazard. Carbon bisulfide was effective under favorable conditions, but its practicable use is limited to areas where advantages of eliminating bindweed at once and planting soon to truck or ornamentals justify the high cost.

The use of tetrachlorethane in the eradication of the European bindweed, A. L. BAKKE. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc.*

Agron., 33 (1941), No. 8, pp. 759-761).—*Convolvulus arvensis* could be eradicated by injecting 2 oz. tetrachlorethane into each hole made 18 in. deep and 18 in. apart. A commercial injector developed for carbon disulfide was satisfactory for the purpose.

HORTICULTURE

[Horticultural studies by the New York State Station] (*New York State Sta. Rpt. 1941*, pp. 41-46, 48, 54-62).—Included in this progress report are statements with reference to fruit variety tests and breeding; rootstocks for grapes; propagation and testing of clonal and seedling rootstocks; behavior of apple varieties on clonal rootstocks; compatibility tests with clonal apple stocks; seed supplies for seedling rootstocks; development of blight-resistant pears; fertilizer trials with fruits in the Hudson River Valley and western New York; fertilizer needs of the strawberry; comparison of mahaleb and mazzard stocks for the Montmorency cherry; culture of the blueberry; and varieties and culture of hops.

Vegetable studies include the breeding of squashes resistant to mosaic and other diseases and insects, fertilizer requirements of vegetables, methods of applying fertilizer, culture of edible soybeans, fertilizers for beets, effect of a beet crop on the succeeding crop of sweet corn, fertilizer placement for peas and cabbage, selection of improved varieties of canning and pole beans, tomato improvement by breeding and variety testing, breeding of muskmelons and squash, spacing of sweet corn, and variety tests of peas and sweet corn. Progress statements are also included on the germination of coniferous tree seed, excising embryos of dormant seeds, germination of herb seeds, and factors affecting the germination of New Zealand spinach seed.

Horticultural problems on Mississippi farms (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 11, pp. 5, 6).—Information is given on the progress of studies on the spacing and training of tomatoes, varieties of tomatoes, comparative resistance of cucumbers to nematodes, pole bean varieties, nitrogen needs of leaf vegetables, planting dates for head lettuce, culture of head lettuce, varieties of apples and grapes, fertilizers for the peach, pruning of the peach, forcing of azaleas for Christmas bloom, etc.

Practical applications of plant growth-substances in horticulture, F. E. GARDNER. (U. S. D. A.). (*Citrus Indus.*, 22 (1941), Nos. 6, pp. 6-7, 11, 14-15; 7, pp. 18-19).—Plant growth substances are discussed with relation to their history, development, and horticultural uses, such as rooting of cuttings, prevention of fruit and leaf abscission, parthenocarpic fruit development, delaying of bud opening, control of branch angles, modifying the solids and acids of the fruit, etc.

In an experiment in which Pineapple oranges were sprayed with naphthalene acetamide at intervals of 3 weeks, begun November 27 and ended February 5, some benefit was noted from the earlier applications. Dropping was small, however, in the entire grove so that the results were not fully conclusive. The evidence indicated that sprays might have been applied to greater advantage earlier than November 27.

Fall preparation best for the early spring garden, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 11, p. 2).—The author points out the advantages of fall preparation of seedbeds designed for the early spring planting of vegetables.

The effects of partial defoliation at transplanting time on subsequent growth and yield of certain vegetable crop plants, J. E. KRAUS (In *Cornell University Abstracts of Theses, 1940*. Ithaca, N. Y.: Cornell Univ. Press, 1941,

pp. 450-452).—Field experiments to determine survival of heavily pruned and unpruned lettuce and cauliflower plants showed no significant differences. Heavy leaf pruning at time of transplanting delayed maturity markedly, but if the growing season was long there was no decrease in total yield. Removal of from 50 to 60 percent of the leaf surface of pepper and onion plants did not significantly affect survival, yield, or marketability. In celery, the removal of from 75 to 80 percent of the foliage did not significantly affect survival but did reduce total growth and yields. Experiments on unpruned and pruned plants following transplanting showed the pruned to lose less water per plant but more water per unit area of leaf surface. After a few days the rate of transpiration became equalized. In general, the rate of root replacement was inversely proportional to the amount of leaf area removed. Carbohydrate determinations indicated that the difference between pruned and unpruned plants in rate of growth, yield, and root replacement following transplanting is related to carbohydrate supply. Partial defoliation prior to transplanting is considered harmful rather than helpful and should be discouraged.

Fertilizer treatment for English peas and cabbage, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 10, p. 7).—Information is presented on the results of studies on fertilizer formulas, rates of application, etc.

The effects of some environmental factors on the content of betanin and sucrose in garden beets (*Beta vulgaris*), L. C. CURTIS (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 447-449*).—Asgrow Canner M 3520 and Ohio Canner M 3721, lines comparatively stable in their betanin content, were grown in sand in six nutrient solutions, and their roots were analyzed for betanin and sucrose. The fresh weight and the betanin and sucrose contents were changed considerably by the nutrient solutions. Soils obtained from eight different market gardens were used in the study of the effect of soil type on the pigment and sucrose content of beets. Marked differences were recorded in fresh weight, betanin, and sucrose. Observations on spring and fall crops of beets, with one varietal exception, showed a higher content of betanin in the fall crop. The trends for sucrose were in the opposite direction. In storage there was at first a rapid decrease in betanin and then an increase, indicating a reversible reaction. There was an early increase of sucrose at all temperatures. At the higher temperatures the early increase was followed by a decline, while at 35° and 40° F. the level was maintained.

The effects of waxing on certain physiological processes of the cucumber under different storage conditions, W. B. MACK and J. R. JANER. (Pa. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 260).—Observations on wax-coated greenhouse cucumbers during 3 weeks in ordinary room temperature in midsummer, in a bank cellar, and in a cold-storage room showed a marked reduction in weight loss and spoilage in the ordinary room. There was an increase in pitting and a significant increase in the respiratory quotient in cold storage, indicating a higher degree of suboxidation.

Choice head lettuce successfully grown under a 3-way program, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 11, p. 8).—Information is presented on cultural aspects.

Storage quality of the principal American varieties of onions, R. MAGRUDER, R. E. WESTER, H. A. JONES, T. E. RANDALL, G. B. SNYDER, H. D. BROWN, and L. R. HAWTHORN. (U. S. D. A. coop. Calif., Ohio, and Tex. Expt. Stas. and Mass. State Col.). (*U. S. Dept. Agr. Cir. 618 (1941), pp. 48*).—Crops of onions were grown from the same lot of seed at Arlington, Va., Davis and Terminous, Calif., Amherst, Mass., Columbus and McGuffey, Ohio, and Winter Haven, Tex., and stored under different conditions for different lengths of

time. As a result of the tests conducted during a 2-yr. period, the varieties tested may be placed in the following groups with reference to their suitability for storage: Very poor, Italian Red; poor, California Early Red, Crystal Wax, Yellow Bermuda, and Early Grano; fair, White Sweet Spanish, Prizetaker, and Sweet Spanish; good, Red Weathersfield, Mountain Danvers, Extra Early Yellow, Early Yellow Globe, Yellow Danvers Flat, Yellow Strasburg, Southport White Globe, Southport Red Globe, Southport Yellow Globe, Ohio Yellow Globe, White Portugal, Ebenezer, and Yellow Globe Danvers; very good, White Creole, Red Creole, and Australian Brown. There were marked differences in the amount of rotting, sprouting, softening and shriveling, and loss of weight in storage of different strains of the same variety. Differences in the rank of the varieties at the different locations could usually be ascribed to such factors as stage of development of the bulb at time of harvest, conditions during and immediately following maturity, length of time between harvest and storage, conditions in storage, and length of the storage period.

Better methods of pimiento production, H. L. COCHRAN (*Georgia Sta. Bul.* 218 (1941), pp. 41, figs. 27).—This general bulletin contains information relative to the variety, seed quality and storage, methods of growing plants, soils and their preparation, use of cover crops and rotations, fertilizers, transplanting operations, field culture, harvesting and grading, the control of insect and disease pests, etc.

The yield and composition of the tomato as influenced by calcium and potassium, R. L. CAROLUS (In *Cornell University Abstracts of Theses*, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 445-446).—An interrelationship between fertilizer materials was shown in a factorially designed field experiment with tomatoes involving manure applied to the preceding crop, lime, and KCl in different amounts. A 200-lb. application of KCl did not increase significantly yields over an 80-lb. application, unless lime or large quantities of manure were present. Lime at the rate of 4 tons per acre did not increase yields significantly unless K or manure was provided also. The combination of 4 tons of lime, 30 tons of manure, and 200 lb. of KCl per acre gave 60 percent more tomatoes than did 80 lb. of KCl on unmanured, unlimed plats. The effect of manure on the K content of foliage was comparable to that of K fertilizer, suggesting that residual manure may function by keeping K from becoming fixed. In nutrient culture studies involving various levels of Ca and K in aerated cultures with Fe, the greatest growth was obtained with large amounts of Ca. Without Fe, the greatest growth was obtained with small amounts of Ca. Tomato roots grown without Fe contained a significantly higher percentage of K, but the stems and leaves were lower in K than in the plants with Fe. It is suggested that part of the influence of lime on K content of the plant under field conditions may be an effect on the solubility of Fe in the soil solution. In spinach, the maximum dry weight and greatest ash and Ca contents were found in plants from solutions containing the largest amount of Ca. Spinach differed apparently from the tomato in that it was able to appropriate K from solutions containing low concentrations of K ions.

Boron and manganese in tomato production, J. B. HESTER (*Amer. Fert.*, 95 (1941), No. 7, pp. 5-8, 24, 26, figs. 4).—Studies with 839 soil samples collected in New Jersey and eastern Pennsylvania, using the sunflower technic, showed B deficiency in some 18 percent of the soils. Lighter soils were more likely to show a lack of B than were the heavier types. There appeared to be no definite relation between soil texture and the occurrence of B deficiency. More acid soils produced deficiency symptoms than did the less acid soils. Mn was found to be associated with the vitamin C content of tomatoes, i. e., soils

with a low soluble Mn content produced tomatoes of a low vitamin C content. There appeared to be a relation of sugars to vitamin C in the fruit. Factors which influence the readily soluble Mn in certain soils were (1) the quantity of total Mn, (2) pH value, (3) organic matter content, (4) salt concentration, and (5) isoelectric point of soil and base exchange capacity.

Building up our orchard soils, A. L. SCHRADER. (Univ. Md.). (*Md. Agr. Soc., Farm Bur., Rpt., 25 (1940), pp. 108-115, figs. 2; also in Md. State Hort. Soc. Proc., 43 (1941), pp. 4-11, figs. 2.*)—In this general discussion on the maintenance and improvement of soil fertility in the orchard, the author presents data on the effect of certain cover crop and soil treatments on the organic matter in a Delicious and Williams orchard located on a Sassafras gravelly loam. The lowest percentage of organic matter was found in the clean-cultivated areas and the maximum where weeds were allowed to grow after June 1. The least penetration of organic matter was in the clean-cultivated areas and the maximum in an area on which soybeans were sown on June 1, followed by rye and vetch on September 1. All covers greatly reduced erosion, which was very serious on the cultivated plots.

Studies concerning the supply of available potassium in certain New York orchard soils, W. REUTHER (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 434-437.*)—Apple seedlings grown in the greenhouse in pots of soil collected in orchards responded to K fertilization in certain instances. There was a fairly close correlation between K content of the leaves of untreated seedlings and the native exchangeable K of the soil. Outdoor treatment with K of young fruit trees affected with severe scorch did not increase growth, as indicated by trunk increment, but did tend to improve foliage condition. Stable manure was helpful in reducing scorch and increased the K content of the leaves. A study of the effects of sod, tillage, and heavy mulch showed that in 4 yr. the heavy mulch had apparently increased the exchangeable K content of the soil. Strawy stable manure was even more effective, and in the case of both straw and farm manure there was sufficient K in the materials to account for the increment in the soil.

Orchard erosion control: A list of references, M. BENTON (*U. S. Dept. Agr., Soil Conserv. Serv., SCS Libr. List 1 (1941), pp. 8.*)—The references are, for the most part, presented with annotations.

Relation between wetting power of a spray and its initial retention by a fruit surface, H. L. CUPPLES. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 11, pp. 681-686, figs. 2.*)—The relation between the wetting power of a spray mixture and its retention on the surface of the fruit was determined by spraying a rotating apple with spray solutions of varying wetting power, as measured by their spreading coefficients on mineral oil, and determining the retention of spray mixture at the point of run-off. When the values of relative retention were plotted against the values of spreading coefficient, there was revealed a close relationship between the values, i. e., the lower the spreading coefficient, the greater the volume of spray retained. It is suggested that the spreading coefficient on a reference mineral oil may be used as a practical measure of the wetting properties of aqueous spray solutions.

Red color increase in fruits after harvest following treatment with methyl bromide, L. L. CLAYPOOL. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 289-290, fig. 1.*)—Methyl bromide used at the rate of 1, 2, and 4 lb, per 1,000 cu. ft. for 1, 2, and 4 hr. on varieties of peach and nectarine which develop naturally a red blush was effective in increasing the amount of color after a 2- to 5-day holding period. Certain treatments were more effective than others, and the Levy cling peach showed the most striking color change of

any of the fruits. Unfortunately, all treatments that enhanced color injured the flavor of the fruits. In one case Delicious apples showed some improvement in color, but Bartlett and Comice pears showed no change. The development of off-flavors eliminates any important commercial use of the methyl bromide treatment.

Fruit juice concentration by freezing and centrifuging, L. R. TUCKER. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 225-230, figs. 2).—A description is given of a method, based on a study of the development and pattern of ice crystal formation in sugar solutions and fruit juices, for concentrating juices by freezing and centrifuging. Blueberry, cherry, currant, elderberry, peach, plum, red raspberry, strawberry, apple, and grape juices concentrated by the process were found to be of good quality. The amount of concentration that could be obtained without serious loss of soluble solids was usually limited by the viscosity of the juices. Treatment of viscous juices, such as blueberry, with a pectin-destroying enzyme reduced the viscosity sufficiently to permit concentration to 45 percent soluble solids.

Comparison of domestic apple and French crab seedlings as stocks under orchard conditions, A. L. SCHRADER and I. C. HAUT. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 328-330).—In 1930 a randomized planting was established of Stayman Winesap, Starking, York Imperial, and Gallia Beauty budded on six understocks, namely, commercial French crab and open-pollinated seedlings of Northern Spy, Rome Beauty, Tolman Sweet, McIntosh, and Fameuse. At the close of the 1938 season part of the trees of each plot were removed because of crowding. Yield and trunk increment data showed no differences of real significance except possibly in Gallia Beauty. Here the differences in yield were not significant, and growth differences were only significant to the 5-percent point. Starking grew somewhat less favorably on McIntosh and Fameuse seedlings, and Gallia Beauty did not thrive as well on Fameuse, Tolman Sweet, and Rome Beauty as on others.

Soils and soil treatments affect the morphology of French crab roots, G. A. FILINGER. (Kans. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 305-310, figs. 6).—A uniform lot of French crab seedlings was divided into six groups, each grown differently with respect to soil, fertilizer, and water treatments. Those grown in soil without added fertilizer and watered sparingly when they showed signs of wilting made the least growth during one season. Trees in the same soil with a constant water supply made the most growth. Striking differences were observed in the gross morphology of the roots, and microscopic studies of the roots showed some interesting effects. The vessels in the roots of trees with a constant water supply were smaller and more numerous than in trees in similar soil with restricted water. The trees supplied with ammonium phosphate had fewer and larger vessels in their roots than did comparable trees without added fertilizer. The number and size of vessels were about the same in trees planted in rich composted soil and in those planted in a mixture of 3 parts of sand and gravel and 1 part of clay.

Cold hardness of Malling apple rootstock types as determined by freezing tests, N. W. STUART. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 311-314).—Portions of the stems of rooted layers of Malling rootstocks grown by the New York State Station were frozen in a controlled chamber. Determinations of the conductivity of the electrolytes exsuded from the frozen and unfrozen tissues showed that freezing produced the smallest increase in conductivity in Malling III and the greatest in Malling I. The etiolated stem base tissue was found much more tender than above-ground

stems. Conductivity readings on frozen roots showed considerably less difference between the types and all roots to be much less resistant to cold than were the stems. In general, however, the roots followed the same order as the tops. The laboratory results agreed rather closely with orchard observations at the station.

The influence of a scion variety on the resistance of the roots against frost, W. FILEWICZ and I. MODLIBOWSKA (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 348-352, figs. 2).—The Antonovka apple, strongly resistant to low temperature in its trunk, branches, and crotch, had a decreasing influence on the hardiness of rootstocks upon which it had been budded. An examination of the roots of nursery trees following a winter when a minimum of -19.3° C. (-2.74° F.) was reached in December while the soil was bare of snow showed more injury to Antonovka trees than to those of other commercial varieties. Trees grafted on clonal dwarf rootstocks showed different degrees of injury related to the top variety. There were, for example, 14 and 81 percent of loss of Malling IX stocks budded with Cox Orange Pippin and Antonovka, respectively.

Cold hardiness of seedlings from certain apple varieties as determined by freezing tests, N. W. STUART. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 315).—Seedlings grown from open-pollinated seed of 31 varieties and from 20 hand-pollinated crosses were frozen in controlled chambers and tested by the electrolyte conductivity technic. There was a high degree of variability in the open-pollinated seedlings, but no higher variation than was recorded in the crossbred seedlings. Seedlings from such hardy varieties as Oldenburg and Wealthy were not consistently harder than those from less hardy kinds. In the least injured group were seedlings of Rome Beauty, Wealthy, Winesap, York Imperial, and Grimes Golden. In the less hardy group were Winter Banana, Golden Delicious, Nero, Bonum, Williams, and King David. There was a noticeable variation within the progeny of any given variety.

Nursery behavior of certain European apple varieties of prospective value as trunk-formers, F. C. BRADFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 353-357).—This paper records the first year's growth from buds at Glenn Dale, Md., of certain foreign varieties of apples included in the test because of their use in Europe as trunk formers or because of reported resistance to winter cold. Virginia Crab was grown for comparison. As 1-year-old whips, only three of the foreign varieties were notably taller than Virginia Crab, one of these being the well-known Antonovka. The variety Surpasse Fréquin was notable for its straight, thick whips. Data taken on the comparative resistance to blight showed only two kinds, White Alphonso and Coulon, to escape completely.

Photosynthesis, transpiration, and growth of apple trees as influenced by various concentrations of oxygen and carbon dioxide in the soil atmosphere, W. H. CHILDS (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 431-433*).—Observations on 1- and 2-year-old budded McIntosh and Delicious trees grown in jars in the greenhouse and aerated to provide an O_2 gradient from 19 down to 1 percent and on trees grown in glazed pots showed that as the O_2 about the roots was decreased below 11 percent there was a gradual depression of growth down to 1.5 to 2 percent O_2 . Below this point a second distinct drop occurred, indicating that a critical point had been reached and what slight growth occurred was at the expense of stored materials. The concentration of CO_2 , within the limits of the study, had little effect on growth, photosynthesis, or transpiration. Until the O_2 concentration about the roots was 2 percent or less, there was no decrease in photosynthesis or transpiration of healthy leaves. The roots could be classified into groups

according to the different concentrations of O_2 . Trees with 12 percent or more of O_2 present about the roots produced a large, reddish-brown, fibrous root system with new growth chiefly at the end of long fibrous roots. The author suggests that in orchard soils, if the soil atmosphere remains less than 12 percent for any considerable period, there may be a depression in growth.

Wind damage to apple trees on selected rootstocks, Kearneysville, West Virginia, July 28, 1940, R. H. SUDDS and P. C. MARTH. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 299-304, figs. 2).—Observations upon apple trees located in the stock and scion experimental orchard at Kearneysville, following a severe storm on July 28, 1940, showed great differences in the behavior of different combinations. Both the stock and scion played a part, as was shown in the varieties Staymared, Starking, and York Imperial on Northern Spy seedlings. The Staymared and York Imperial trees suffered severely, while the Starking trees suffered much less damage. Trees of the above three varieties suffered less injury as a whole on seedling than on clonal rootstocks. Trees on Malling XIII and XV showed the least injury of any of the clonal groups. Size of tops did not have any particularly consistent influence on wind injury. Very little injury was recorded in a block of 124 trees of York Imperial, Gallia Beauty, Jonathan, Staymared, Golden Delicious, and Starking, all on Malling II. In another block, 1 of 54 Red Rome trees on Malling XIII and 15 of 29 Red Rome trees on Malling I were blown over or broken off. The trees were of nearly identical size.

The prevention of premature apple fruit dropping by spraying with plant growth substances, F. A. HERMAN, C. R. MACEachern, and J. M. CAMERON (*Nova Scotia Fruit Growers' Assoc. Ann. Rpt.*, 77 (1940), pp. 124-125).—Application of hormone sprays to the trunk or limbs of apple trees had no effect on fruit dropping, leading to the conclusion that it is necessary to wet the stems of the fruit. The first application should be made at the time dropping begins. Plats receiving no spray showed a percentage drop of from 10 to 39 percent, while the sprayed limbs showed a loss of from 0 to 13 percent in the same period. A spray containing from 2 to 4 oz. of material per 100 gal. of water was most satisfactory. Greater concentrations tended to cause difficulty in picking the apples.

Treatment of peach seed as affecting germination and growth of seedlings in the greenhouse, D. H. SCOTT and J. G. WAUGH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 291-298, figs. 3).—Of different media used in the germination of afterripened peach seed, muck, sand-muck, and muck-peat gave somewhat better results than soil, peat, sand-peat, and indolebutyric acid-treated sand. Seed in muck and sand-muck germinated more quickly and more uniformly than in soil or quartz sand. The addition of indolebutyric acid to sand inhibited germination. The poorest growth was made in the peat and sand-peat lots. Vitamin B_1 had no apparent effect on root development. In a second experiment with seven media and with the seeds disinfected with 2 percent chlorinated lime, better germinations were obtained in some of the media than in the first trial. Bank sand, sand-soil, and soil were the superior media. The largest plants were grown in the muck and muck-soil. In the third experiment with bank sand, bank sand-muck, and fine quartz sand, there was no difference between media or between the two varieties used—Gold Drop and Elberta. Excellent drainage conditions in the flats appeared to have overcome the germination differences recorded in the first two trials. However, 115 days of afterripening gave definitely superior results to 65 days. Where pits were removed the 65-day period of afterripening gave as high germination as 115 days, but seedling emergence was slower and many of the plants showed the dwarfed condition associated with insufficient afterripening. There seemed to be

less danger of disease injury to seedlings if the seeds were removed from the pits prior to afterripening.

Potassium translocation in peach roots, O. W. DAVIDSON. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 26).—The roots of 1-year-old peach trees supplied with a K-free nutrient solution until symptoms of severe K deficiency developed were so placed that the upper and lower tiers of the side roots were in separate sand cultures, with or without K in the nutrient solutions. Analyses of fleshy and fibrous roots less than $\frac{1}{8}$ in. in diameter showed conclusively that K is translocated readily from the lower to the upper roots or vice versa.

Tennessee Shipper strawberry, L. A. FISTER (*Tennessee Sta. Cir.*, 76 (1941), pp. [4], figs. 2).—Originated by the station from a cross of Missionary \times Blakemore, this new variety is considered very promising because of its productivity, good shipping qualities, attractive appearance, and healthy foliage.

Time limits of the grape bud-graft method, E. SNYDER and F. N. HARMON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 373-374).—Observations on 1-year-old vines of Solonis \times Othello No. 1613, grafted on the first and fifteenth day of the month from July 1, 1939, to July 1, 1940, inclusive, with Sultanina, showed in general good success throughout the year. The period November 1 to January 15 was not as satisfactory in percentage of stand as before or later. Growth from the buds inserted between November 15 and January 1 averaged less than from earlier or later budding. Growth from buds inserted May 15 to July 1 did not mature sufficiently to recommend this period for commercial practice.

On aerial propagation of grapes, C. A. MAGOON and I. W. DIX. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 388-392, figs. 5).—A description is presented of the structure and use of a rooting receptacle found useful in the aerial propagation of the grape. In boxes containing moist sphagnum moss installed on vines on May 27, 1940, well-developed roots were observed on June 18. Positive rooting was obtained in all the varieties used, but some loss occurred in the removal from the parent vine and in potting. Rooting was obtained from the current season's wood, but the plants were unable to make sufficient growth that season to render the method practical. The method is believed to have its greatest use in physiological studies and perhaps for the rapid increase of some particularly promising seedlings.

Carbohydrate changes in muscadine grape shoots during the growing season, T. A. PICKETT and F. F. COWART. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 393-394, fig. 1).—In connection with propagation studies, cutting wood collected at monthly intervals throughout the growing season from Hunt vines was analyzed for various carbohydrates. Sucrose decreased slightly during the first part of the growing season, followed by a sharp decrease until a minimum was reached in August, about the time the fruit matured, but from August to late November there was a gain in sucrose of more than 10 times. Reducing sugars increased in the early season, declined until October 26, and then increased rapidly. Starch values showed a general increase from May through November, while the acid-hydrolyzable fraction remained constant.

Maturity studies with California grapes.—I, **The Balling-acid ratio of wine grapes**, M. A. AMERINE and A. J. WINKLER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 379-387, fig. 1).—Based on the Balling-acid ratio determined for some 100 varieties of grapes growing at Davis, Calif., the varieties were classified into three groups as to their adaptability and probable value in wine making. Group A, varieties with ratios below 28.6, 31.4, and 34.3 at 20°, 22°, and 24° Balling, gave typical dry table wine grapes. Group B.

varieties exceeding the above ratios at the three Balling densities, yielded typical sweet dessert wine grapes. Group C, including varieties which at 20° or 22° Balling have a ratio below those given but which exceed the ratio at a higher Balling density should be grown under warmer or cooler environments than at Davis for the production of dessert or table wine grapes, respectively. The quality of the wines could not be predicted by the methods followed.

Citrus rootstock trials in southern Nigeria, D. B. MURRAY (*Trop. Agr. [Trinidad]*, 18 (1941), No. 10, pp. 197-199).—Observations on plantings at two locations led to the general conclusion that the sour orange is the most suitable rootstock for oranges and grapefruit in southern Nigeria. Sweet orange gave good results, especially for the orange, but there was some question as to resistance to gummosis. There was no significant effect of stocks on size of fruit, and the variation in rind thickness was too great to permit of drawing any conclusions.

Comparative study of initial and subsequent size of citrus cuttings and budlings, F. F. HALMA. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 336-338, figs. 2).—Conducted as a logical follow-up of the earlier noted study (E. S. R., 70, p. 629), in which no significant differences were shown between citrus cuttings and budlings while still in the nursery, this investigation dealt with the relation between the size of the nursery tree and its growth in the orchard up to the time of fruiting. From the Eureka lemon data, the author concludes that the rootstock was not a factor in the decreasing correlation between initial and subsequent tree size. Data on oranges showed the same general trends, although the navel cuttings and budlings differed markedly in the first years.

Adventitious buds in citrus, M. M. EL AZOUNI and S. H. CAMERON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 363-368, figs. 5).—Observations on 3-year-old seedlings of sour orange, sweet orange, lemon, and rough lemon disbudded in various ways showed in general that complete removal of buds resulted in the production of numerous adventitious buds. "Tree seal" asphaltum apparently stimulated the regeneration of both callus tissue and adventitious buds. Indoleacetic acid did not stimulate the development of such buds. In the investigation, adventitious buds developed only from scar tissues. Of the plant materials used, sour orange and lemon appeared to possess the greatest capacity for regeneration.

Severe manganese deficiency of citrus, E. C. LEVITT and R. I. NICHOLSON (*Agr. Gaz. N. S. Wales*, 52 (1941), No. 9, pp. 477-479, figs. 4).—Extreme leaf and twig symptoms of manganese deficiency observed in a Valencia orange tree were corrected by manganese sulfate-lime sprays. The tree was planted on a spot where older orange trees had been burned and where the pH of the soil was 7.0-7.2.

Azaleas adapted to most sections of Mississippi, F. S. BATSON (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 10, pp. 1, 2, 7, fig. 1).—Information is presented with regard to adaptation, varieties, and cultural considerations.

Camellia japonica adapted to State home gardens, F. S. BATSON (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 11, pp. 1, 8, fig. 1).—Information is presented on varieties, fertilizers, transplanting, control of insect pests, and utilization.

Lily breeding problems, G. L. SLATE (*Lily Year-Book*, No. 9 (1940), pp. 11-17, pls. 2).—The author discusses the opportunities and difficulties in lily breeding and outlines the possibilities in certain groups for the development of new garden varieties. Many of the fine hybrids produced in the past were said to have been lost as a result of virus diseases and must be reproduced under virus-

free conditions. The breeding of disease-resistant lilies is needed to stabilize the lily-producing industry.

The effect of various nitrogenous compounds on the rooting of rhododendron cuttings treated with α -naphthaleneacetic acid, B. W. DOAK (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 6A, pp. 336A-343A).—All of a number of inorganic and organic nitrogenous materials, used in the supplemental treatment of cuttings after soaking in an α -naphthaleneacetic acid, had some beneficial effect on rooting. Where cuttings were treated with nitrogenous materials alone, the response was negative except in the case of lysine, guanine, alloxan, aspartic acid, asparagine, and xanthine. Of the two inorganic materials ammonium sulfate and sodium nitrate, the former was considerably more effective. The possibility that the chemicals may have a similar effect to rhizocalin is suggested. Some tests with β -indolebutyric acid showed this to be more active than α -naphthaleneacetic acid with the species of rhododendron used.

Continued rose research at Cornell, R. C. ALLEN. (Cornell Univ.). (*Amer. Rose Ann.*, 1941, pp. 143-158).—Further information is presented (E. S. R., 84, p. 338) on the effect of different planting depths, time of planting, moisture and nutrient requirements, winter protection, summer mulches, use of fertilizers, and the handling of the soil.

The details of rose hybridization, A. C. FRASER. (Cornell Univ.). (*Amer. Rose Ann.*, 1941, pp. 97-102, fig. 1).—A description is presented of the rose flower, the natural processes of pollination and fertilization, and the technics of hand-pollination.

The importance of soil aëration, A. W. BOICOURT. (Cornell Univ.). (*Amer. Rose Ann.*, 1941, pp. 159-160).—Observations on rose plants grown under the following treatments, (1) clay soil without aeration, (2) clay soil with aeration, (3) clay-peat soil without aeration, and (4) clay-peat soil with aeration, showed much more growth where aeration was provided. In both clay and clay-peat the total linear growth per plant and the average number of flowers per plant were almost doubled with forced aeration. Clay-peat soil without aeration was more effective than clay with aeration, indicating that the peat itself was an effective factor in increasing aeration.

FORESTRY

A basis for forecasting seed crops of some coniferous trees, G. S. ALLEN (*Jour. Forestry*, 39 (1941), No. 12, pp. 1014-1016, figs. 2).—A method based upon the number of ovulate buds as estimated in August or September of the year preceding the maturation of cones and seeds is presented for forecasting seed crops of Douglas fir. This method gave a value to the potential cone crop that may be obtained easily and with reasonable accuracy. Adverse factors, such as unfavorable weather, insect damage, and abortions, must be considered in the estimates.

A study of jack pine seed, T. SCHANTZ-HANSEN. (Univ. Minn.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 980-990).—Cones of different ages collected from 92 jack pine trees located in 8 separate regions of Minnesota were opened in electric ovens, and the seed was extracted by hand. Tests conducted in a Toumey germinator showed no significant drop in germination until 3-year-old seeds were used. The decline in germination percentage of older seed was due, in part, to an increase in the number of empty seeds. The considerable percentage of viable seed in the older cones indicated that such may be important in natural regeneration. The source of the seed was important, and certain trees produced seed of low quality, apparently due to parthenospermy. There was no

significant drop in moisture content of the cones after the first year for at least 7 yr.

Seed production in the tulip poplar, A. T. GUARD and R. E. WEAN. (Purdue Univ.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 1032-1033).—A study of tulip-tree seeds, collected from different portions of 20 trees in southern and central Indiana, indicated that seeds from the upper two-thirds of a tree are slightly better than those from the lowest one-third. Within individual fruits, the middle one-third of the seed is of the better quality. The fertility of the soil within ordinary limits did not appear to be a significant factor in determining quality of the seed. There was apparently little difference between seed of trees growing in close and open stands.

Planting white pine in laurel and rhododendron "slicks," L. S. MINCKLER. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, p. 1036).—Plantings of white pine in laurel and rhododendron thickets were not successful except where some preparation of the soil preceded planting. Grubbing had little advantage over cutting or partial cutting in the form of strips or spots. Partial cutting was successful provided the openings were adequate to prevent the thicket from overtopping and suppressing the planted pines.

Soil changes associated with loblolly pine succession on abandoned agricultural land of the Piedmont Plateau, T. S. COLLE (*Duke Univ., School Forestry Bul.* 5 (1940), pp. 85, figs. 17).—In the presence of adequate sources of seed, loblolly pine establishes itself on abandoned agricultural land within 10 yr. after cultivation has ceased. Because of high initial density, loblolly pine tends to retard the early development of hardwoods, such as oaks and hickories, which are dominant in the climax forest but do not ordinarily become conspicuous in the reproduction layer of pine stands until the latter are from 20 to 40 yr. old. Apparently certain soil changes, such as a marked increase in the depth of the A₀ horizon, which occur in the loblolly pine stand, favor the reproduction of hardwoods and discourage pine regeneration. Changes in soil characteristics, found to accompany the development of old field pine stands, i. e., a more favorable carbon:nitrogen ratio in the surface soil, a higher level of exchangeable calcium, a more favorable mobilization of nitrates, and a higher water-holding capacity, would tend to favor loblolly pine as well as hardwoods. The tendency of pines as they reach an age of about 20 yr. to concentrate their small roots near the surface is thought to discourage young pines more than young oaks and hickories with their sturdy taproots. Any surface treatment that would reduce competition for soil moisture and nutrients should improve seedbeds for loblolly pine and permit the regeneration of this species.

Hail damage in second-growth longleaf pine, E. L. STONE and L. F. SMITH. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 1033-1035, figs. 3).—An examination of young longleaf pines growing near Alexandria, La., 4 yr. following a severe hailstorm which occurred on April 30, 1937, disclosed rows of circular scars on the north side of many stems and on the upper side of branches of certain trees. An examination of sections taken from damaged trees showed that severe defoliation resulting from the hail had retarded diameter growth and had caused numerous defects that would aid in distinguishing hail injury from that due to insects or fire.

Effect of gypsy moth defoliation in certain forest trees, W. L. BAKER. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 1017-1022, figs. 4).—"To determine economic injury by the gypsy moth to forest trees in the New England States, records of defoliation, death of trees, and loss of diameter increment were collected from trees in a wide series of plats from 1912 to 1921. Data from the oaks and white pine, species suffering greatest economic injury, show

that an increase in average defoliation was associated in general with an increase in mortality. Growth and defoliation data of four species of oaks and white pine show a direct correlation between percentage of defoliation and decline in radial increment. Diameter growth of black, white, and scarlet oaks was found to fluctuate inversely with percent of defoliation the same year defoliation occurred. In young white pines defoliated only once there was direct correlation between percent of defoliation and percent of trees dying during the following 9-yr. period."

Compression wood in weeviled northern white pine, S. H. SPURR and R. B. FRIEND (*Jour. Forestry*, 39 (1941), No. 12, pp. 1005-1006, fig. 1).—The development of compression wood was studied in 19 sections taken from 14 white pine trees cut in the Yale Forest near Keene, N. H. The trees ranged in age from 39 to 45 yr. and in diameter at breast height from 4.2 to 7.7 in. In these trees weeviled nodes occurred at heights of from 3 to 14 ft., except in one case at a height of 26.3 ft. The compression wood was present to such an extent in most of the logs as to cause a serious defect in the lumber cut from the center. The horizontal extent of the compression wood equaled roughly the pith offset.

Pulpwood production costs on small operations in the upper Connecticut River Valley, V. S. JENSEN. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 991-993, fig. 1).—Tree size was found to be the major factor affecting per-cord costs of pulpwood, due apparently to two causes, (1) the excessive time consumed in handling small trees and bolts, and (2) the fact that approximately the same amount of nonproductive time was involved in working up and handling small or large trees. Per-cord time decreases rapidly for size classes from 5 up to 8 in. in diameter and remains at a minimum level from about 10 to 12 in. The various operations are analyzed as to their part in the total costs. The species of tree was a factor in costs, as shown by the fact that from 40 to 60 percent more time was required to limb a spruce than a fir tree.

Two new girdling saws, F. G. LIMING. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 1029-1032, fig. 1).—The construction and operation are described and discussed.

DISEASES OF PLANTS

Plant-virus differentiation by trypan-blue reactions within infected tissue. F. P. McWHORTER. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Stain Technol.*, 16 (1941), No. 4, pp. 143-148, figs. 4).—By this method the amorphous and crystalline inclusions constituting cytological evidence of viruses are said to stain proportionately. The effects of different viruses react differently to the stain, and those inclusions not absorbing trypan blue tend to stain with phloxine. This selective staining is the basis for using trypan blue singly and in combination with phloxine as standardized procedures for demonstrating and differentiating cytological evidence for plant viruses. The tests are very rapid and are especially applicable to temporary mounts, but permanent mounts can be made from material fixed in formalin.

A study of purified viruses with the electron microscope, W. M. STANLEY and T. F. ANDERSON (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 325-338, pls. 4, fig. 1).—In studies of purified preparations of five viruses used, the electron micrographs of the ultracentrifugally isolated tobacco mosaic virus exhibited a predominating unit about 15 $m\mu$ wide and 280 $m\mu$ long and presumably representing single virus particles, together with aggregates formed by end-to-end and side-to-side aggregation of this unit and a small amount of rods with shorter though variable lengths. The fact that the dimensions of this unit were of the

same order of magnitude as those estimated previously by indirect methods based on physicochemical data indicates that the latter procedures are useful and essentially valid even for asymmetrical particles, when correctly used. Since the particle length of this virus was significantly greater than those of two strains studied by others, it seems likely that virus strains may differ in particle lengths. The electron micrographs of cucumber virus 3 and its related strain 4 were very similar, showed a marked end-to-end aggregation, and indicated that the ultimate units closely resembled those of tobacco mosaic virus in size and shape. The micrographs of tomato bushy stunt virus exhibited spherical particles about 26 $m\mu$ in diameter, and tobacco necrosis virus particles were essentially spherical and about 20 $m\mu$ in diameter.

A tweezers method for making microscopic sections of plant pathological material, I. H. CROWELL (*Mycologia*, 33 (1941), No. 3, pp. 335-337, figs. 6).

[Abstracts of phytopathological papers] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 50-51, 51-52, 164-165, 169-170, 194, 195, 197-198, 200-201, 202-203).—Abstracts of the following papers were not included among those listed from another source (E. S. R., 85, p. 768): Observations on Grass Diseases in Kentucky and Their Relation to Grass Improvement, by L. Henson, J. T. Spencer, and T. H. Rogers (pp. 50-51) (Ky. Expt. Sta.); Studies on the Control of *Cercospora* Leaf Spots of Peanut, by T. T. Hebert and L. Shaw (p. 51) (N. C. Sta.); Certain Diseases Which May Contribute to the Failure of White Clover in the South During the Summer, by H. R. Albrecht (pp. 51-52) (Ala. Sta.); Recent Research on the Control of Tomato Diseases, by A. L. Harrison (pp. 164-165) (Tex. Sta.); Pecan Seedling Growth Response to Boron, by G. H. Blackmon (pp. 169-170) (Fla. Sta.); Cotton Seedling Disease and Boll-Rot Surveys in Mississippi in 1938-40, by L. E. Miles (p. 194) (Miss. Sta.); Isolation and Infection Tests With Seed-Borne Cotton Pathogens, by J. H. McLaughlin and W. W. Ray (p. 195) (Okla. A. and M. Col.); Some Observations on Wilt Resistance of Shafter Acala Cotton at Greenville, Texas, by D. R. Hooton (p. 197) (U. S. D. A.); Cotton Nutrition in Relation to *Fusarium* Wilt, by G. M. Armstrong and W. B. Albert (p. 198) (S. C. Sta.); The Reaction of Cotton Varieties to *Fusarium* Wilt and Root Knot Nematode, by A. L. Smith (pp. 200-201) (Ga. Sta.); and Factors Influencing the Control of Fungus Disease With Copper Fungicides, by A. A. Nikitin (pp. 202-203).

[Abstracts of theses] (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 72-74, 82-84).—The following are of interest to plant pathology: Soil-inhabiting Fungi Attacking the Roots of Maize, by W.-C. Ho; and The Effect of Insect Control on the Yield and Quality of Cotton Prematurely Killed by Cotton Root Rot, by S. E. Jones.

Cornell University abstracts of theses, 1938 (*Ithaca, N. Y.: Cornell Univ. Press, 1939, pp. 301-304, 325-326, 331-335, 343-344*).—The following are of phytopathological interest: The Effect of Sulfur Fungicides on the Photosynthesis and Respiration of Apple Leaves, by R. A. Hyre (pp. 301-304); Contributions to Knowledge of the Genus *Taphrina* in North America, by W. W. Ray (pp. 325-326); Studies in the Genus *Typhula* Fries, by R. E. Remsberg (pp. 331-332); Studies on the Downy Mildew of Spinach and the Causal Organism *Peronospora spinaciae* Laubert, by M. C. Richards (pp. 333-335); and The White Smut of Water Lilies, by A. P. Viégas (pp. 343-344).

Cornell University abstracts of theses, 1940 (*Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 285-287, 317-318, 329-330, 345-351, 427-430, 453-455, 463-464, figs. 2*).—The following are of interest to plant pathology: Studies of Adhesives for Sulfur Dusts, by E. M. Stafford (pp. 285-287); The Protection of Cereal Crops With Sulfur Dusts, by K. D. Butler (pp. 317-318); Morphological, Cul-

tural, and Pathological Studies in the Genus *Heterosporium*, by J. E. Jacques (pp. 329-330); A Contribution to Our Knowledge of the Germination of the Conidia of *Sclerotinia fructicola* with Special Reference to the Toxicity of Copper, by C.-K. Lin (pp. 345-348); Studies on the Yellows Disease of Lettuce and Endive, by M. B. Linn (pp. 349-351); Lime and Acid Induced Chlorosis of Roses, by J. C. Ratsek (pp. 427-430); A Study of Some Factors Influencing Blackheart Development in Celery, by B. J. T. Landry (pp. 453-455); and The Inheritance of Resistance to Tomato Wilt Caused by *Fusarium lycopersici* Sacc., by A. R. Trotter (pp. 463-464).

[Work in plant pathology by the New York State Station] (*New York State Sta. Rpt. 1941, pp. 33-40, 52-54*).—Progress is briefly noted on investigations of orchard diseases including control of apple scab and *Coccomyces* leaf spot of cherry, and infection factors and control of brown rot of peach; of small fruit diseases with special reference to control measures, including grape, raspberry, currant, and gooseberry; diseases of vegetable crops, including disease surveys, peas with special reference to seed treatment and to foot rot and root rot, tomato leaf blight control, and control of mosaics in beans by resistant varieties; improvement of yellows-resistant strains of kraut and Danish cabbage; variation in *Fusarium solani martii* f. 2 as to virulence and other characters; control of downy and powdery mildews, leafhoppers, and sooty mold of hops; seed treatment and spraying and dusting lima bean plants; and studies of seed-borne micro-organisms of various crop plants and their control.

[Plant disease work by the New York State Department of Agriculture and Markets] (*N. Y. State Dept. Agr. and Markets, Ann. Rpt., 1939, pp. 172-183, 186-187, 189-191, figs. 9*).—Progress reports are included on Dutch elm disease control, peach X-disease, and onion blot due to *Ditylenchus dipsaci*.

Twentieth annual report of the Canadian Plant Disease Survey, 1940, I. L. CONNERS (*Canada Dept. Agr., Sci. Serv., Plant Disease Survey Ann. Rpt., 20 (1940), pp. [1]+XVI+104, fig. 1*).—This report follows the same general procedure as previous ones of the series (*E. S. R., 84, p. 771*).

Die wichtigsten Krankheiten und Schädlinge der landwirtschaftlichen und gärtnerischen Kulturpflanzen und ihre Bekämpfung: Für Praxis und Studium [The most important diseases and pests of field and garden crop plants and their control: For practice and study], H. BRAUN and E. RIEHM (*Berlin: Paul Parey, 1940, pp. VII+270, figs. 194*).

Comunicaciones fitopatológicas [Phytopathological communications], A. M. GUARCH (*Rev. Facult. Agron. [Montevideo], No. 23 (1941), pp. 9-20, figs. 5*).—Notes are presented on the presence of *Scolecotrichum graminis* and its variety *brachypoda* in Uruguay; *Cercospora medicaginis* on *Medicago arabica*; a new host of *Puccinia anomala* in Uruguay, viz, *Hordeum murinum*; *Septoria gladioli* on gladiolus; *P. arachidis* on *Arachis marginata*; *Phylospora malorum*; *Pestalotia molleriana*; *Helminthosporium ravenelli*; and soft scald of apples.

Bacterial contamination of seeds, A. W. HOFER and H. C. HAMILTON. (N. Y. State Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 5 (1940), pp. 264-265*).—The authors conclude from their own work, together with studies by others, that although surface bacteria are readily killed by dilute chemical disinfectants, the species vary in their resistance. When testing the action of disinfectants it is necessary to find one that is effective after 10 minutes' exposure of the particular seed surface to be disinfected. The bacterial flora on seeds used for farm planting may, except for phytopathogens, for the present be ignored, since no evidence is at hand indicating any harmful effects on germination or growth.

Sphagnum for seed germination inhibits damping-off losses on unsterilized soil, V. STOUTEMYER, C. HOPE, and A. CLOSE (*Natl. Hort. Mag.*, 20 (1941), No. 2, pp. 111-120, figs. 6).—A more complete account of this study is given below.

The control of damping-off by the use of sphagnum for seed germination, C. HOPE, V. T. STOUTEMYER, and A. W. CLOSE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 397-406, figs. 4).—"Without sterilization of seed or substrate, and with little attention to watering, sphagnum has given as good results as any other good medium regardless of treatment. The diversity of plants used in these tests, covering a great taxonomic range, promises wide suitability of sphagnum to seed of various kinds. In the other requirements of a germinating medium, it is always equal, and generally superior, to soil and to sand."

A new *Cercospora* on *Leucothöe*, B. H. DAVIS. (N. J. Expt. Stas.). (*Mycologia*, 33 (1941), No. 5, pp. 523-525, fig. 1).—*C. leucothoes* n. sp. from leaves and stems of *Leucothoe catesbaei* is described.

The germination and staining of basidia in *Gymnosporangium*, L. S. OLIVE. (Univ. N. C.). (*Stain Technol.*, 16 (1941), No. 4, pp. 149-153, figs. 4).—By this method the rust spores are germinated on slides in damp chambers, about 3 hr. being required for sporidial production. The material is killed by inverting the slides over osmic acid fumes for a few minutes. Germinated spores are then allowed to dry on the slide, no fixative being required. Material must be thoroughly dehydrated in the alcohols, returned to water, mordanted for 2-3 hr. in 4 percent iron alum, stained 2-3 hr. in 0.5 percent aqueous solution of Heidenhain's hematoxylin, and destained in 2 percent iron alum. The material is then passed back through the alcohols and mixtures of xylol and absolute alcohol to xylol, and mounted in balsam. The method has proved particularly satisfactory for *Gymnosporangium* spp., which have readily gelatinized telia. The details of natural germination are preserved intact, and many details of nuclear division are excellent.

A new polypore in Washington, E. E. MORSE. (Univ. Calif.). (*Mycologia*, 33 (1941), No. 5, pp. 506-509, figs. 5).—*Polyporus flettii* n. sp. from forest terrain is described.

A comparative study of strains of *Rhizoctonia solani* (Kuhn) with special reference to their parasitism, I. F. STOREY (*Ann. Appl. Biol.*, 28 (1941), No. 3, pp. 219-228, pl. 1, figs. 4).—From cross-inoculations of *R. solani* isolates from various host plants, the existence of marked physiologic races was indicated, some strains having a wide host range and others a more selective parasitism. The divergent results obtained on seedling hosts with a fungus inoculum of high organic content was shown due to the unfavorable soil conditions created by the fungus. Examining the behavior of different isolates, the resistance of crucifers to those from potato appeared to be correlated with the presence of a substance inhibitory to the growth of the fungus, whereas the appropriate strain was able to tolerate it. Enzyme was found to be produced by the fungi on both susceptible and nonsusceptible host tissue, and differences in the secretion of pectinase by the two strains were noted. The behavior of subturgid and turgid swede tissue to the action of the fungus and the enzyme was shown to differ. The enzyme from the cruciferous isolate was most active on turgid tissue, yet such water-soaked tissue was rendered much less susceptible to invasion by the fungus. There are 25 references.

Four phycomycetes destructive to nematodes and rhizopods, C. DRECHSLER. (U. S. D. A.). (*Mycologia*, 33 (1941), No. 3, pp. 248-269, figs. 5).—The following are described: *Cystopage* n. gen. (Zoopagaceae), and the new species *C. lateralis*, *C. subtilis*, *Acanulopage stenospora*, and *Cochlonema symplocum*.

Creolin as a powerful fungicide, V. P. YAGODKINA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 5, pp. 453-455*).—Preliminary trials appear to indicate that creolin dust may prove a valuable means of controlling *Botrytis cinerea* and other hyphomycetous fungi.

Diseases of small grains, S. B. FENNE (*Va. Agr. Col. Ext. Bul. 151 (1941), pp. 28, figs. 20*).—An informative bulletin on cereal diseases and their control.

Diagnosis of virus diseases of cereals, V. K. ZAZHURILLO and G. M. SITNIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 7, pp. 664-666, fig. 1*).—Investigating normal and virus-infected rye, barley, oats, millet, moha, rice, and nine species of *Triticum*, it is concluded that a differential diagnosis of cereal virus diseases is possible on the basis of anatomical and cytological characters, including vacuolar bodies, phloem necrosis, and protein crystals. These characters are briefly discussed.

Anguillulina dipsaci from "tulip root" oats injuring seedlings of a seeds mixture, T. GOODEY (*Jour. Helminthol., 19 (1941), No. 1-2, pp. 1-8, pl. 1*).—Pot experiments indicated the oats strain capable of causing serious injury to young seedlings of a number of grasses and clovers of a seed mixture, though the general failure of the parasite to establish itself and persist beyond the seedling stage suggests that these hosts are unlikely to constitute reservoirs of this nematode strain. It is suggested that where tulip root in oats has occurred the stubble should be plowed under and buried as completely as possible to remove the parasites from the surface soil and in this way avoid the risk of damage to the young seedlings of a seed mixture.

Razas fisiológicas de "Puccinia triticina" procedentes de Ipanema, San Pablo, Brazil [Physiologic races of *Puccinia triticina* from Ipanema, São Paulo, Brazil], J. VALLEGA (*Rev. Argentina Agron., 8 (1941), No. 1, pp. 57-59; Eng. abs., p. 59*).—Races 19, 64, and 105 were isolated from wheat samples. The last two are well known in Argentina, but race 19 was determined for the first time in South America.

Biochemical modifications in the cereals affected with the virus of winter wheat mosaic, N. A. RIAKHOVSKY and A. L. FEDULAEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 7, pp. 667-668*).—Among the modifications found in response to infection, the monosaccharides and disaccharides were strongly increased, the content in both total and protein N was somewhat lowered, the C:N ratio was much affected, and the deviations in P content, though not large, tended definitely toward a decrease.

The effect of high temperature on the stem rust resistance of wheat varieties, T. JOHNSON and M. NEWTON (*Canad. Jour. Res., 19 (1941), No. 11, Sect. C, pp. 438-445, pl. 1*).—In greenhouse tests, 18 stem rust-resistant varieties were compared as to reactions to 3 physiologic races of *Puccinia graminis tritici* at constant temperatures of about 60° and 80° F. and at intermediate fluctuating daily temperatures of 50°-55° at night and 70°-85° at midday. At the low and intermediate temperatures some of the varieties proved immune, whereas others were highly or moderately resistant. At the high temperature 5 varieties (Bokveld, Iumillo, Gaza, Red Egyptian, and N. A. 95 Egypt) were immune or highly resistant, 6 were moderately resistant, and 7 were moderately or highly susceptible.

Bunt or stinking smut of wheat (a world problem), C. S. HOLTON and F. D. HEALD (*Minneapolis, Minn.: Burgess Pub. Co., [1941], pp. [1]+II+211, figs. 21*).—The aim of the present monograph was to make available a single publication that will serve as a source of general information on the present status of the bunt problem in its various aspects and as a basis for more detailed reviews of selected phases and for projecting further researches. The

subject matter has been grouped into 11 chapters as follows, each with its own bibliography adding to a grand total of 1,163 references: Introduction; economic importance of bunt; species distinction, spore germination, and artificial culturing of the bunt fungi; host range of the bunt fungi and other species of *Tilletia* affecting wheat or other cereals; factors affecting infection by the bunt fungi and their development in the host; effect of bunt on the morphology and physiology of the wheat plant; physiologic specialization in the bunt fungi; cytology of the bunt fungi; heterothallism, hybridization, and species association in *T. tritici* and *T. levis*; varietal reaction and the genetics of resistance to bunt; and seed treatment and cultural practices for bunt control.

Nota sobre "Ustilago bullata" [Note on head smut of grasses (*Ustilago bullata*)], E. HIRSCHHOEN (*Rev. Argentina Agron.*, 8 (1941), No. 2, pp. 160-164, fig. 1).

Inheritance of resistance to six physiologic races of bean rust, W. J. ZAUMEYER and L. L. HARTER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 10, pp. 599-622, figs. 7).—Greenhouse investigations of 4 crosses involving 6 varieties or strains of beans and 6 physiologic races (1, 2, 6, 11, 12, and 17) of *Uromyces phaseoli typica* were carried out to determine the mode of inheritance of resistance. The results indicated that seedling resistance to races 1 and 2 was due to a single Mendelian factor. Possibly other genetic factors may be involved in the resistance of the hybrids inoculated with races 6, 11, 12, and 17. Resistance was shown to be dominant in the hybrids inoculated with races 1, 2, 6, and 12, and incompletely dominant in those inoculated with races 11 and 17. Severely variegated plants inoculated with race 6 showed immunity and those mildly variegated a lower susceptibility than normal plants. This may have been due to the physiological behavior of the host and the fungus, to modifying genetic factors, or to a combination of these. It is possible that a major gene may govern resistance within grade 0-4 in the hybrids inoculated with races 11 and 12, and a similar factor susceptibility within grade 5-10. Minor modifying factors may be responsible for the variable resistance and susceptibility within the major classes. An F_2 line related to progenies previously inoculated with race 11 showed several classes of resistance and susceptibility not previously observed, which explains in part at least the reason for the presence of these variable classes in F_2 . Transgressive segregation occurred in the hybrids inoculated with race 11, since one-fourth of the F_2 plants showed more resistance than the less susceptible parent. Results with F_2 progenies inoculated with race 17 showed environment to exercise some influence on the degree of infection in the intermediate class. Under an unfavorable environment the plants appeared resistant and segregated in a ratio of 3 resistant to 1 susceptible, whereas under more favorable conditions they segregated in a 1:2:1 ratio.

Ist die Bespritzung der Blattunterseiten bei der Bekämpfung der Cercospora-Blattfleckenkrankheit der Rübe notwendig? [Is spraying the undersides of the leaves necessary to the control of *Cercospora beticola* leaf spot of beets?], H. WENZL (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 51 (1941), No. 1, pp. 20-24).—A preliminary report.

Soil bacteriological studies on the control of the Phymatotrichum root rot of cotton, R. B. MITCHELL, D. R. HOOTON, and F. E. CLARK. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 9, pp. 535-547, figs. 2).—This study was undertaken to determine the relations of soil micro-organisms to cotton root rot in the alkaline "blacklands" of Texas. Hunt clay with added organic matter and inoculated with *P. omnivorum* either completely inhibited growth of the pathogen or permitted initial growth followed by mycelial disintegration. In

the field, cotton roots injured or cut off from aerial parts during late summer supported great increases in the numbers of associated soil organisms often leading to disintegration. The majority of the root rot sclerotia buried in manured soil were quickly destroyed during active bacterial multiplication. Inorganic fertilizers failed to induce the necessary microbial activities leading to these results. Field application of organic materials followed by plowing early in October increased microbial activity very greatly, reduced to minimum numbers the sclerotia in treated zones, and materially cut the losses of cotton in the next year.

Studies on the resistance of eggplant varieties to *Phomopsis* blight, F. L. HOWARD and R. DESROSIERS. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 337-340).—In the studies reported, the pathogenesis of *Phomopsis vexans* seemed to be confined in varying degree to eggplants, no other species of *Solanum* tried giving evidence of infection. However, the fungus grew vigorously on many kinds of dead plants and may apparently survive for several years or indefinitely on the debris from various crop plants. The relative resistance of varieties was comparable on the basis of greenhouse and field tests, though the absolute resistance was generally somewhat greater in the field. The fungus penetrated equally well the leaf surfaces of all eggplant varieties tried, but since some failed to develop symptoms of the disease, the resistance factor is considered to be protoplasmic or vital in nature. Varieties of eggplant resistant to *Phomopsis* blight are said to exist and only await further development.

The beneficial effect of boron on jute, B. K. PALIT (*Cur. Sci. [India]*, 9 (1940), No. 11, pp. 499-500, fig. 1).—A note on boron deficiency and its amelioration by boric acid treatment.

La importancia de algunas especies de "Fusarium" en el pietin y el marchitamiento de "Lupinus albus," "Lup. angustifolius" y "Lens esculenta" en el Uruguay [The importance of some species of *Fusarium* in foot rot and wilt of *Lupinus albus*, *L. angustifolius*, and *Lens esculenta* in Uruguay], C. J. M. CARRERA and W. NOLL (*An. Soc. Cient. Argentina*, 131 (1941), Nos. 4, pp. 152-184, figs. 9; 5, pp. 185-211, figs. 6).—The authors investigated the role of *Fusarium* spp. in the foot and wilt disease of white and blue lupines and of lentil. Following a summary of the literature (51 references), the diseases as observed in the field and the species of *Fusarium* concerned are described. The systematic determination and description of each species is then presented, together with a résumé of present knowledge concerning its pathogenic role. Finally, inoculation experiments are described demonstrating the pathogenicity of the species investigated (*F. avenaceum*, *F. scirpi acuminatum*, *F. orchoceras*, *F. oxysporum aurantiacum*, *F. solani*, and *F. culmorum*) and the etiological relations of each.

Doenças da mandioca no nordeste [Diseases of manihot in northeastern Brazil], J. A. DESLANDES (*Campo [Rio de Janeiro]*, 11 (1940), No. 131, pp. 9-13, figs. 13).

Meios de controle e bacteriose da mandioca [Methods of controlling manihot bacteriosis due to *Bacillus manihotus*], J. S. BRANDÃO, JR. (*Campo [Rio de Janeiro]*, 11 (1940), No. 130, pp. 62-63).

Manchas das fôlhas da mandioca, produzidas por *Cercosporas* [*Cercospora* leaf spots of manihot], A. P. VIÉGAS (*Bragantia*, 1 (1941), No. 3, pp. 233-248, pls. 4). General accounts are given of the leaf spots due to *C. henningsii* and *C. caribaea* and their control, with 48 and 9 references, respectively.

Notas sobre as doenças das cebolas e seu combate [Notes on onion diseases and their control], O. A. DRUMMOND (*Ceres [Minas Geraes]*, 2 (1940).

No. 9, pp. 245-250).—Such diseases as *Macrosporium* leaf spot, fungus bulb rots, smut, and downy mildew are briefly discussed.

Mosaic, chlorosis, and necrosis in virus-infected perennial pepper caused directly by products of a deranged metabolism, H. H. MCKINNEY and C. H. HILLS. (U. S. D. A.). (*Science*, 94 (1941), No. 2442, pp. 372-373).—It is concluded from this study that the secondary chlorosis, mosaic mottling, and xylem necrosis observed were induced directly by translocated or diffused products of a deranged metabolism, which in turn was induced by relatively small amounts of virus in remote zones. Alterations in enzyme balance, and the ultimate chlorosis, indicate that the virus is able to incite profound changes in tissues remote from zones of detectable virus and, finally, these changes are so drastic in necrosed tissues that the virus is completely destroyed soon after these tissues have become desiccated.

Studies in the physiology of the virus diseases of the potato.—IV, A comparison of the nitrogen relations of healthy and crinkle potatoes, together with some observations on the nitrogen relations of a "carrier" variety, E. BARTON-WRIGHT (*Ann. Appl. Biol.*, 28 (1941), No. 3, pp. 229-237, figs. 7).—Continuing this series (E. S. R., 72, p. 205), "an investigation was made into the nitrogen relations of healthy and crinkle infected (virus A+X) potato plants. Statistically significant differences were found in total nitrogen, protein nitrogen, residual nitrogen, amide nitrogen, and toward the close of the growing season in nitrate nitrogen between the laminae of healthy and diseased plants. Similar statistically significant differences were found in the petioles. The total nitrogen content and protein nitrogen content of all parts of crinkle infected plants at all times in the growing season were found to be higher than in healthy material, and this difference is statistically significant. It is suggested that the loss in yield brought about by crinkle is due to some at present unknown derangement of the nitrogen metabolism of the diseased plants. The presence of a latent virus in a carrier variety, in this case paracrinkle in the variety President, does not cause any significant differences in total nitrogen or any of the nitrogen fractions."

Estudio sobre un virus productor del "marchitamiento apical de la papa" [Study of the virus causing top necrosis in potatoes], A. M. OFFERMANN and E. R. VITORIA (*Rev. Argentina Agron.*, 8 (1941), No. 2, pp. 105-113, pls. 2).—The virus was shown to be *Solanum* virus-1 [potato mottle virus]. Its properties were studied and compared to those of *Lycopersicum* virus-3 [tomato spotted wilt virus], and the symptoms of the disease are described.

A comparison of *Fusarium avenaceum*, *F. oxysporum*, and *F. solani* var. *eumartii* in relation to potato wilt in Wisconsin, J. G. MCLEAN and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 9, pp. 495-525, figs. 8).—The symptoms and fungi of these three wilts are compared. A strain of *F. avenaceum* isolated from diseased potato plants proved capable of infecting and producing vascular discoloration of roots, stems, and tubers in both greenhouse and field, though several single-spore lines differed slightly in their attack. Root penetration occurred rapidly with each of the three pathogens, hyphae being found in the roots and lower stem of infected plants. Mycelia of *F. oxysporum* were closely confined to the xylem vessels of the stem, those of *F. avenaceum* were abundant in both the vascular and cortical tissues of the lower stem, whereas the mycelia of *F. solani eumartii* were most abundant in the stem cortex. Heavy-walled xylem cells filled with a dense granular deposit and disintegration of certain cells of the stem phloem and xylem were associated with infection by each. Abnormal tissue effects in advance of invasion were greatest from *F. solani eumartii*.

Air temperatures favoring optimum growth of potato and of the *F. avenaceum* strain were 20°-24° C., but a soil temperature of 28° proved most favorable for infection. A soil with water-holding capacity held at 50 percent was more conducive to infection than were those at 30 or 70 percent. Seed-piece inoculation at planting time was successful in inducing development of the three wilts in field tests. The effects of various treatments were measured by the time required for foliage symptoms to appear and the severity of tuber symptoms. Differences among inoculation methods appeared closely correlated with amount of inoculum in proximity to the plant. Irish Cobbler and Rural New Yorker varieties were more susceptible to attack by these fungi than Bliss Triumph or Katahdin. Early planting of inoculated seed pieces resulted in a higher percentage of infection and in more severely diseased tubers than did late planting.

F. solani eumartii wilt was the most aggressive and resulted in the highest percentage of severely infected plants. *F. avenaceum* was similar to *F. oxysporum* in percentages of infection, severity, time of appearance of leaf symptoms, and temperature most favorable for infection. These two fungi differed slightly from each other in their temperature requirements for growth and in the symptoms induced. Infected plants in the northern part of Wisconsin displayed leaf rolling, reddening, and rosetting of the foliage, and aerial tubers in the leaf axils. These symptoms were not pronounced in a similar plot in southern Wisconsin. The greatest percentage of plants with purple top resulted from inoculation with *F. avenaceum*, some were found associated with *F. oxysporum* wilt, but few with *F. eumartii* wilt.

A new method of identifying potato tubers free from bacterial ring rot and other types of tuber decay, V. E. IVERSON and H. C. KELLY (*Montana Sta. Mimeog. Cir. 20 (1940), pp. 4, figs. 2*).—The ultraviolet light fluorescence method as worked out by the station is described and illustrated.

A progress report on the rice maladies recently observed in central Luzon with special reference to the "stunt or dwarf" disease, I. J. A. AGATI, P. L. SISON, and R. ABALOS (*Philippine Jour. Agr., 12 (1941), No. 2, pp. 197-210, pls. 7*).—The rice diseases rampant in central Luzon (1940), as studied by the authors, presented three sets of symptoms, viz, (1) stunted growth and general yellowing of the whole plant, (2) stunted growth and gradual yellowing of individual leaves starting with the older ones, and (3) marked stunted growth with yellowish-white specks on the young unfolded leaf which as it develops and unfurls eventually coalesce to form broken or almost continuous streaks along the veins. The first condition was usually associated with poor and dry soils, and the second was found due to the direct attacks of leafhoppers, one of which was *Nephotettix bipunctatus*. The third type proved to be the virus stunt or dwarf disease, which was experimentally transferred by the above-named leafhopper as vector.

Wanted: Research for cure of sick soybeans, B. KOEHLER. (Ill. Expt. Sta.). (*Soybean Digest, 2 (1941), No. 1, pp. 6-7, figs. 5*).—A brief survey of soybean diseases and control problems.

Un nuevo parásito de "Sorghum sudanense" en la Argentina [A new parasite of Sudan grass in Argentina], E. HIRSCHHORN (*Rev. Argentina Agron., 8 (1941), No. 3, pp. 262-263, pl. 1, fig. 1*).—A note on the smut of *Holcus sorghum sudanensis* due to *Cintractia sorghi*.

The diseases of sugar cane, S. C. BRUNER (*Asoc. Téc. Azucareros Cuba, Proc., Ann. Conf., 14 (1940), pp. 69-104, figs. 12*).—This is a review of the sugar-cane diseases known to occur in Cuba, including mosaic, *Helminthosporium* eyespot, ring spot (usually attributed to *Leptosphaeria sacchari*), *Helmintho-*

sporium brown stripe, *Cercospora* brown spot, *Helminthosporium* target blotch, *Fusarium* pokkah-boeng disease, *Pleocyta* (formerly known as *Melanconium*) rind disease, root disease complex and associated fungi, and bacterial red stripe disease, with briefer notes on various miscellaneous troubles.

Sugarcane smut in Bihar, S. A. RAFAY and S. Y. PADMANABHAN (*Cur. Sci. [India]*, 9 (1940), No. 11, pp. 496-497, figs. 3).—Notes on the incidence and pathology of smut, the spores of which are said to have agreed mostly with those described for *Ustilago scitaminea*.

Hot water treatment for control of nematodes in sweet potato seed roots, E. F. BURK and G. TENNYSON. (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 299-302, fig. 1).—From the evidence presented, it appears that nematodes may be safely eliminated from sweetpotato roots by heating at 116° F. or slightly higher for 65 min. With 122° or higher there was too much injury to the root tissues for use with any degree of success, and it appeared that roots are damaged to some extent by a 50-min. treatment at 119°. Of the two varieties (Nancy Hall and Improved Porto Rico) used, there was some evidence that roots of the latter were the more heat-tolerant, although additional tests are needed to establish this point.

Factors affecting physiological breakdown of maturing tobacco, G. M. SHEAR (*Virginia Sta. Tech. Bul.* 74 (1941), pp. 16, figs. 6).—This breakdown of maturing leaves includes the leaf spot previously described as "drought spot" as well as "rimfire." The symptoms may be modified in wet weather due to the influence of weak parasites. This type of injury occurs in Virginia on tobacco grown on soils of too low fertility and light texture and is thus most common on flue-cured and dark fire-cured tobaccos. The underlying factors in susceptibility are nutritional, nitrogenous fertilizers increasing it and particularly with N high in relation to potash. Phosphates did not affect this disorder, whereas K, Mg, and Cl reduced the susceptibility. If improperly fertilized, tobacco is subject to this breakdown during excessively wet or dry seasons, and rainfall for the entire growing season appears more important than that immediately preceding maturity of the tobacco. Furthermore, the lower the plant is topped, other conditions being the same, the greater will be the breakdown injury. A number of changes in tobacco culture and fertilizer recommendations made in recent years, while improving the quality of the crop, also tend to reduce the possibility of damage from breakdown. Thus, in harvesting flue-cured tobacco there has been an almost complete shifting from cutting to priming in which the plant is topped higher and the leaves can be harvested before overripeness. In recommendations for flue-cured tobacco in Virginia, the amount of potash has been doubled, the N has not been increased and on richer soils it is reduced by 3-2 percent, and 2 percent Mg and up to 3 percent Cl are included in the fertilizer. Except under the most adverse weather, progressive farmers should not be troubled from injury to their tobacco resulting from physiological breakdown.

A study by means of the electron microscope of the reaction between tobacco mosaic virus and its antiserum, T. F. ANDERSON and W. M. STANLEY (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 339-344, pl. 1, fig. 1).—Micrographs of a mixture of virus and normal rabbit serum exhibited virus particles of normal size (280 m μ by 15 m μ) and indicated little or no adsorption of particles from normal serum onto virus molecules. Similar results were obtained with mixtures of tobacco mosaic virus with antisera to tomato bushy stunt, potato latent mosaic, and tobacco ring spot viruses. A mixture of tobacco mosaic virus with its antiserum from rabbits, dried on a collodion film an hour after mixing and examined by the electron microscope, showed particles about

60 μ wide, about 300 μ long, and having fuzzy profiles. The increase in particle width and fuzzy appearance are regarded as indicating that the ends of asymmetrically shaped molecules from the serum react specifically with the antigen molecules. No reaction between tobacco mosaic virus antiserum and bushy stunt virus was demonstrable. When the mixture of antigen and antiserum was applied to a collodion film several hours after mixing, an irregular framework of thickened antigen molecules was noted. It is this framework which makes up the antigen-antiserum precipitate. These results demonstrate the usefulness of the electron microscope and of a large and distinctively shaped antigen such as tobacco mosaic virus for studying the antigen-antibody reaction.

Proteolytic activity of a preparation from tobacco mosaic virus, M. N. VOROBIEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 30 (1941), No. 5, pp. 466-467*).—The data obtained are said to be explained in one of two ways: Either the virus itself hydrolyzed the proteins in infected tomato seedlings, or the virus preparation used served only to adsorb on its surface the proteolytic enzymes of the host plants which caused the activity observed.

The serological reactions of viruses causing tobacco necrosis, F. C. BAWDEN (*Brit. Jour. Expt. Pathol., 22 (1941), No. 2, pp. 59-70, fig. 1*).—A method for purifying tobacco necrosis viruses involving little or no loss of infectivity is described, and evidence is presented that this necrosis is a disease that may be caused by a number of serologically unrelated viruses. All the viruses used failed to crystallize, and it was shown that the culture from which N. W. Pirie et al.³ obtained crystals was a mixed virus. It is suggested that the serologically distinct tobacco necrosis viruses have particles differing in size, and they may differ also in stability. The behavior of these viruses on heating, aging, or treating with dilute alkali differs from that of potato X-virus, for the former are rendered noninfective without being denatured and they remain fully active antigenically.

Transmission of tobacco etch viruses by aphides, B. KASSANIS (*Ann. Appl. Biol., 28 (1941), No. 3, pp. 238-243*).—"Severe etch virus is transmitted by *Myzus persicae*, *M. circumflexus*, *Aphis rhamni*, *A. fabae*, and *M. gei*. Although the content of mild etch virus in sap is much less than that of [severe etch virus], both are transmitted to the same extent by *M. persicae*. The percentage of infection using single aphids is greatest with aphids that are starved for 4 hr. or more and then fed on the source of infection for 2 min. Continuous feeding on healthy plants or diseased plants greatly reduces the efficiency of the vector. The length of time for which aphids remain infective is also increased from 15 min. to a few hours if the aphids are starved instead of allowed to feed; it is also greatly increased in starved insects if they are kept at low temperature. Provided the feeding time on each test plant is small, one aphid may infect up to four plants."

Hyperauxiny in crown gall of tomato, G. K. K. LINK and V. EGGERS (*Bot. Gaz., 103 (1941), No. 1, pp. 87-106, fig. 1*).—In extraction trials with hypocotyls of noninoculated and inoculated tomato, frozen vacuum-dried (lyophilized) material failed to yield auxins to dry ether, the free auxins apparently remaining fixed until liberated by water. Wet ether gave the best results, but even after 17 successive extractions during 209 days the process of auxin liberation had not been completed. Material boiled before extraction yielded all its free auxin in one extraction by Soxhletization with wet ether for 24 hr., whereas nonboiled material continued to yield auxin. By combining these methods the

³ Parasitology, 30 (1938), No. 4, pp. 543-551, pl. 1, fig. 1.

free auxin content could be distinguished from the potential or bound auxin. The latter may be a measure of auxin precursors, and is obtainable in part by digestion with chymotrypsin in the presence of toluene, from material freed from free auxin. The *Phytophthora tumefaciens*-inoculated hypocotyl yielded both more free and more potential auxin than the noninoculated. The significance of the finding that this growth disturbance (crown gall) is associated with disturbance in auxin relations (dysauxiny) is discussed with reference to the theory that auxins play roles in normal and in healthy growth of plants and in the causal complex of gall development. There are 33 references.

A Phytophthora tomato disease new to Ontario, L. T. RICHARDSON (*Canad. Jour. Res.*, 19 (1941), No. 11, Sect. C, pp. 446-483, pls. 2, figs. 9).—As observed in greenhouses, this disease was characterized by a damping-off of seedlings and a rot of stems, fruits, leaves, and roots and found due to *P. parasitica*. The effects of various nutrient media, temperature, atmospheric humidity, and acidity of medium on the growth of the fungus in culture were studied. In an extensive study of certain factors affecting the parasitic activity of this soil-borne pathogen, the disease was found to be favored by high atmospheric temperature and high relative humidity. The incidence also varied directly with the moisture content of the soil and was at its maximum near 22° C. The ability of the fungus to establish itself in soils depended on the soil type, the other micro-organisms present, and on the substrate available for saprophytic development. The rates of invasion of noninfested soils were found to be retarded by the competitive factor and accelerated by the presence of living roots of tomato seedlings. The activity of the pathogen was suppressed by adding soybean residue to infested soil. The potential host range of the strain studied, as partially determined by inoculations, is wide but mostly confined to the Solanaceae. Several control methods tried are discussed. There are 30 references.

A foliar diagnosis study of greenhouse tomato plants showing symptoms of streak disease, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 319-328, figs. 3).—"In a greenhouse experiment with differentially fertilized tomatoes with and without manure, the plants on one plat treated with nitrogen only without manure exhibited symptoms of having become infected with the virus causing streak disease, 10 weeks after planting. The method of foliar diagnosis [E. S. R., 79, p. 23] was applied to determine the nature of the disequilibrium between the labile (plastic) elements in the leaves of diseased plants by means of a comparison of the intensities of nutrition and of the physiological relations with respect to nitrogen, phosphoric acid, and potash in the sixteenth and twenty-fourth leaves from the base, respectively, of diseased plants with those of morphologically homologous leaves of healthy, vigorous, and probably resistant plants. The physiological relations (ratios) are indicated by a magnitude designated the NPK-unit which represents the equilibrium between $N-P_2O_5-K_2O$ in the selected leaves at the moment of sampling. The derivation and method of calculating the NPK-unit are described. The results indicate that the symptoms of infection of the virus causing streak were associated with a lower intensity of nutrition and a disequilibrium with respect to nitrogen, phosphoric acid, and potash manifested predominantly by much higher values for nitrogen and much lower values for potash in the NPK-unit of diseased compared with healthy plants."

Scientists seek tomato varieties resistant to Verticillium wilt, L. H. BLOOD. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, pp. 5, 8, figs. 2).—Placing emphasis on the need for an increase in the production of this important crop, the author presents a general account of the *V. albo-atrum* wilt,

which is said to be the most devastating and least conspicuous disease of tomatoes in Utah and also to attack potatoes and eggplants. Crop rotations of not less than 5 yr., and for severe infestations 10-15 yr., are necessary to rid the soil of the fungus. The lasting solution lies in obtaining resistant varieties. Promising selections of hybrids with Peruvian wild tomatoes are now being backcrossed and outcrossed to commercial varieties in an effort to increase the fruit size, and reselected on the trial grounds for resistance.

Serological studies of the Erwineae.—I, *Erwinia amylovora*, R. P. ELROD. (Ohio State Univ.). (*Bot. Gaz.*, 103 (1941), No. 1, pp. 123-131).—In serological comparisons of nine isolates of the fire blight organism from five localities and from as many different hosts, on the basis of agglutination tests and agglutinin-absorption experiments, no antigenic difference among any of them could be detected. Carbohydrate materials extracted from the bacterial cells and used in precipitation tests likewise failed to differentiate among the isolates. Serologically, *E. amylovora* appears to be an exceedingly homogeneous species.

The origin and histology of bordeaux spray russeting on the apple, H. P. BELL (*Canad. Jour. Res.*, 19 (1941), No. 12, Sect. C, pp. 493-499, figs. 10).—In McIntosh Red apple trees sprayed about the time of full bloom (1939-40), the origin and structure of the resultant russet were studied. The first apparent injury is a browning of the epidermal cells at the base of the hairs on the fruit. The growth of these browned cells is inhibited and cracks develop as the fruit enlarges. Adjacent hypodermal and cortical tissue is exposed and killed, and cork cambiums and cork are formed in the cortex. This cork differs in origin from normal russet cork, which originates in the epidermis. The further enlargement of the fruit causes the cracks to multiply, deepen, and extend tangentially. All tissues external to the innermost point of fissure penetration are killed, and the final scurflike patches of scar tissue are a mixture of dead epidermis, hypodermis, cortex, cork, and cork cambiums. This scar tissue is not true cork.

Influence of time of harvest on storage scald development of Rhode Island Greening and Cortland apples, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), p. 58).—An abstract.

Observations on the new so-called virus disease of peach trees in Washington, E. L. REEVES and L. M. HUTCHINS. (U. S. D. A.). (*Wash. State Hort. Assoc. Proc.*, 36 (1940), pp. 116-119).—This is a note on a peach disease somewhat resembling the "X-disease," with a discussion and classification of some of the peach disorders observed in Washington State during the 1940 growing season.

La "viruela de la púa" en los durazneros y almendros del nordeste Bonaerense [The stem canker of the peach and almond in the northeastern Buenos Aires Province], C. JAUCH (*Rev. Argentina Agron.*, 8 (1941), No. 3, pp. 206-215, pls. 2).—This study concerns the hosts, taxonomy, culture characters, and pathogenicity of the causal fungus *Phoma persicae* and the symptoms, predisposing factors, and control of the disease.

Red leaf of grapevines in California prevented by controlling mites, H. E. JACOB, W. B. HEWITT, and E. L. PROEBSTING. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 285-292).—A serious type of red leaf in black grape varieties is characterized by the development in early summer or mid-summer of red or bronze-red color in the leaf tissues between the primary veins and partial to complete defoliation by late summer or early fall, usually followed by a weak development of new leaves toward the ends of the canes. No correlation could be found with the K content of the soil, with irrigation, or with various trace elements or other factors, but the condition was found to be closely associated with mite (*Tetranychus pacificus*) injury. It was prevented by con-

trolling the mites when done before the injury became too far advanced, but killing the mites after the red coloring had appeared in the leaves failed to check its further development. Early summer spraying with Selocide and ammonium polysulfide proved effective against the mites, but no beneficial results from the spray were observed to carry over into the following season. Other forms of red leaf are differentiated.

A comparison of fungicidal treatments for the control of Botrytis rot of grapes in storage, W. T. PENTZER and W. R. BARGER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 281-284).—Among a considerable number of volatile fungicides tried for control of grape storage rot due to *Botrytis* sp., SO₂ fumigation (20 min. at 1 percent concentration) before the fruit was packed proved most effective.

Latent infection in tropical fruits discussed in relation to the part played by species of Gloeosporium and Colletotrichum, J. H. SIMMONDS (*Roy. Soc. Queensland Proc.*, 52 (1941), No. 10, pp. 91-120, pls. 6).—A review of the literature (32 references) revealing a lack of information on the subject, inoculations of immature bananas in the field indicated that *G. musarum* can remain in a latent condition for 5¼ mo. and then resume activity to produce typical anthracnose lesions as the fruit ripens, but only a portion of the original infections may finally develop into ripe-fruit spots. Histological structures involved in latent infection are discussed and illustrated in relation to species of *Gloeosporium* and *Colletotrichum* on banana, papaw, and mango. A fine thread penetrates the cuticle directly from the appressorium and forms a hyphal structure adjacent to the cellulose wall of the epidermal cell. This subcuticular hypha is considered to be the form in which the fungus survives the latent period. Suggestions are made as to the inability of the fungus to become actively parasitic in the green fruit. The outer cellulose wall appears to form a barrier in the operation of which the constitution of the cell sap may play a role. Several practical applications of the theory are suggested as approaches to the ripe-rot problems. The appressorium is considered important in that its main function is to aid infection by providing a firmly attached reservoir from which the infection thread may be produced. It is more resistant than the spore to certain chemicals. The appressorium is probably homologous with a chlamydospore.

Phytophthora boehmeriae, causante de la podredumbre morena de los frutos cítricos, en la República Argentina [Phytophthora boehmeriae causing brown rot of citrus fruits in the Argentine Republic], M. J. FREZZI (*Rev. Argentina Agron.*, 8 (1941), No. 3, pp. 200-205, figs. 3).—The fungus is described and its pathogenicity established.

Manganese deficiency in citrus, E. R. PARKER and R. W. SOUTHWICK. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 51-58, fig. 1).—Symptoms of Mn deficiency on citrus were found to be widespread in California, but their distribution differed from that of Zn deficiency symptoms. Mn symptoms were generally mild and occurred on highly productive as well as on decadent trees. Severe symptoms were in some areas associated with early decline on lemon trees. Though the leaf symptoms were eliminated by spraying with Mn mixtures, no obvious effects on tree health or yields resulted during 2 yr. except in the case of severely deficient orange and grapefruit trees the leaves of which had dropped prematurely. Suitable sprays were developed for treating Mn deficiency. Improper sprays resulted in burning of young orange and lemon leaves, and in other toxicity symptoms on lemon leaves. In two cases Mn sprays seriously increased the injury due to subsequent fumigation with HCN, a result that could not be duplicated at will.

The diseases of the coconut palm, H. R. BRITON-JONES, revised by E. E. CHEESMAN (London: Baillière, Tindall & Cox, 1940, pp. XVI+176, pls. 37, [figs.] 4).—This is a semipopular handbook with bibliography of over 16 pages.

A transmissão experimental da "mancha anular" do cafeeiro [Experimental transmission of ring spot of coffee], K. SILBERSCHMIDT (*Biologico*, 7 (1941), No. 4, pp. 93-99, pls. 3, fig. 1; *Eng. abs.*, p. 99).—Transmission was effected by grafting but not through seed or sap. Symptoms could be observed on the scion only after a graft union with diseased stocks of at least 10 mo., and even then only on scions grafted to badly infected stocks. In this respect, ring spot of coffee is said to behave like infectious chlorosis of the Malvaceae, whereas the symptoms are very similar to those of citrus leprosis and tobacco ring spot.

A new species of *Ceratostomella* on the date palm, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Mycologia*, 33 (1941), No. 5, pp. 468-482, 11).—The principal reason for erecting a new species for this fungus is that the perfect stage has been demonstrated, and it is also shown that the imperfect stage differs in several ways from *Chalaropsis thielavioides*. Because of its attack on the roots of the date palm it is named *Ceratostomella radiciala*.

Red-blotch of *Hippeastrum*, T. LASKARIS and B. O. DODGE (*Bul. Torrey Bot. Club*, 68 (1941), No. 7, pp. 463-466, figs. 5).—A serious disease of *Hippeastrum* (amaryllis) plants was found associated with *Stagonospora curtisii*, the pathogenicity and causal relations of which were established. The symptoms are described in detail. Plants of the genera *Amaryllis*, *Chlidanthus*, *Crinum*, *Galanthus*, *Hippeastrum*, *Hymenocallis*, *Leucojum*, *Lycoris*, *Narcissus*, *Pan-cratium*, *Sternbergia*, *Sprekelia*, *Zephyranthes*, and *Eucharis* are known to be susceptible, but a number of inoculated *Hemerocallis fulva* (tawny daylily) seedlings failed to become diseased.

Concerning lilies infected with the mosaic virus, D. E. GREEN and M. A. H. TINKER (*Lily Year-Book*, No. 9 (1940), pp. 28-33, pls. 4).—This is a general discussion, with special reference to England, where *Lilium auratum*, *L. longiflorum*, and *L. speciosum* are said to show signs of mosaic disease most frequently. Aphid control by nicotine dusts has not proved entirely efficient. With respect to roguing, the value of repeated observations is stressed, as well as the necessity of propagating from virus-free material and the value of raising lilies from seed. There are 24 references.

A mosaic disease of *Primula obconica* and its control, C. M. TOMPKINS and J. T. MIDDLETON. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 11, pp. 671-679, figs. 3).—The symptoms of this disease, prevalent in greenhouses in San Francisco, include a prominent leaf mottle, consisting of irregular-shaped, dark-green, raised or nonraised islands on a light-green to yellow background with upward curling of the leaves and occasionally a shoestring effect at or near the tips. Leaves, petioles, peduncles, and flowers are reduced in size, the last with variegated petals and mottled calyx. Infected plants are usually badly stunted. The virus was readily transmissible by juice inoculation by the carborundum method, and the incubation period was 16-21 days. The green peach and lily aphids failed to transmit the virus under greenhouse conditions. The virus was infective at 22° C. after 24 hr., but not after 48 hr. It was inactivated by heating for 10 min. at 50°, and its dilution tolerance was 1:10. The virus is limited to two other species, viz. *P. malacoides* and *P. sinensis*. The disease has been eradicated by careful roguing of diseased plants and by frequent fumigation of the greenhouses.

Roses, rheumatism, and relativity, L. M. MASSEY. (Cornell Univ.). (*Amer. Rose Ann.*, 1941, pp. 135-142).—A survey of major rose diseases and their control.

A fungus disease of some species Rosa, G. E. DEACON (*Rose Ann. Natl. Rose Soc.*, 1941, pp. 113-115, pls. 2).—Notes on the sudden wilting and dying of certain species of *Rosa* due to *Didymella sepincoliformis*, with observations on the fungus and its relationships.

"Botrytis tulipae," parásito del tulipán en la República Argentina [Botrytis tulipae parasitizing tulips in Argentina], M. D. CAMPI (*Rev. Argentina Agron.*, 8 (1941), No. 1, pp. 16-18, pls. 2).

Important nut diseases in Virginia, S. A. WINGARD. (Va. Expt. Sta.). (*North. Nut Growers Assoc. Proc.*, 31 (1940), pp. 103-106).—A brief summary.

Diseases of chestnut trees and nuts, G. F. GRAVATT and M. E. FOWLER. (U. S. D. A.). (*North. Nut Growers Assoc. Proc.*, 31 (1940), pp. 110-113).—A review of the ravages caused by the chestnut blight and root rot in the United States, and notes on a serious nut decay of Chinese chestnuts known since 1939 and associated with a *Glocosporium*-like fungus. Most selections of the hairy Chinese chestnut are said to be sufficiently resistant to various diseases and possessed of such other desirable qualities as to justify recommending them for limited planting as home nut trees in parts of the Middle Atlantic and Northern States where they are hardy.

Further report on induced immunity to chestnut blight, G. A. ZIMMERMAN (*North. Nut Growers Assoc. Proc.*, 31 (1940), pp. 117-118).—A progress report on the work previously noted (E. S. R., 76, p. 353).

Effects of downy spot on photosynthesis and transpiration of pecan leaves in the fall, A. J. LOUSTALOT and J. HAMILTON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 80-84, fig. 1).—The data obtained clearly indicate that photosynthesis was markedly reduced by *Mycosphaerella caryigena* infection, the reduction being somewhat greater than would be expected from the extent of leaf surface apparently invaded. Both normal and diseased leaves continued to function late in the season, but with a gradual decline in rate, until abscission occurred after a severe frost. Infected leaves also averaged less transpiration than normal leaves, though there were some exceptions, particularly when leaves were in the shade or conditions for evaporation were unfavorable. In the morning, high rates of CO₂ absorption usually corresponded with high transpiration rates and vice versa, whereas in the afternoon the relationship of the two processes was generally reversed. There was a close parallel in daily fluctuations of photosynthesis and transpiration of healthy and diseased leaves due to differences in weather conditions.

Correction of manganese-deficiency symptoms of walnut trees, O. L. BEAUCHER and R. W. SOUTHWICK. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 133-136, figs. 2).—While Mn-deficiency symptoms have been reported in many other crops for several years, the recognition of these symptoms in walnuts is relatively new. The authors approached the correction of symptoms by injecting dry Mn salts, liquid injection of Mn salts under high pressures, spraying Mn salts onto the tree, and soil treatments with MnSO₄ and S as well as S alone, with promising preliminary results. Severely mottled leaves, when sprayed during the May 15-June 30 period, cleared up and remained normal the rest of the season.

Cankers and decay of yellow birch associated with Fomes ignarius var. laevigatus, W. A. CAMPBELL and R. W. DAVIDSON. (U. S. D. A. et al.). (*Jour. Forestry*, 39 (1941), No. 6, pp. 559-560, fig. 1).—The causal relation was confirmed by inoculations.

South American leaf spot disease of Hevea (*Canal Zone Expt. Gard. Ann. Rpt.*, 1940, pp. 28-29).—A note on the occurrence and seriousness of the *Dothidea ullei* leaf spot on Pará rubber trees.

Pyrenomycete note, J. H. MILLER (*Mycologia*, 33 (1941), No. 3, p. 333).—*Mycosphaerella nigrita* n. comb. from oak leaves is transferred from the genus *Sphaerella*.

Two pine plantings near cultivated red currants in New York, W. H. SNELL (*Jour. Forestry*, 39 (1941), No. 6, pp. 537-541, figs. 3).—Detailed data led to the conclusion that very little if any white pine blister rust infection was traceable to cultivated red currants, but that probably in both these plantings the infection noted came from sporidia from wild gooseberries.

The sampling of Ribes populations in blister rust control work. T. H. HARRIS. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 317-323, fig. 1).—An accurate knowledge of the number of currant and gooseberry bushes and their distribution in forested areas is a prerequisite for *Ribes* eradication to control white pine blister rust. Such knowledge is gained by a systematic sampling ("checking") of control areas, the successful technic and administration of which are described.

Western red rot control for the Black Hills, S. R. ANDREWS and L. S. GILL. (U. S. D. A. et al.). (*Jour. Forestry*, 39 (1941), No. 10, pp. 817-823, figs. 3).—To determine the abundance and behavior of western red rot (*Polyporus ellisianus*) in immature stands of *Pinus ponderosa* and to develop methods for use during stand-improvement operations by which serious future losses might be averted, a survey of 1,582 trees on 26 stands was made (1935-36). The results indicated that rot incidence in first logs varied directly with age and diameter at breast height and inversely with density and was concentrated in the so-called large-branched trees which had one or more dead branches larger than 1.5 in. diameter inside bark below a height of 17 ft. In thinned stands infection increased from 5 percent in the 41-60-yr. age class to 10 percent in the 61-80-yr. age class. Average infection in 81-120-year-old unthinned stands was 27 percent, which indicates a rapid increase in incidence above 80 yr. The maximum infection originating below a height of 17 ft. under natural conditions was about 33 percent. In thinned stands, infection in the 8-9-in. trees was about four times that in the 4-5-in. trees. In the same stands, 22-31 percent of the trees with large dead branches were infected, as compared to only 4-7 percent of those with only small dead branches.

Considerable reduction in ultimate decay loss can be effected in stands up to 80 yr. old where the predominating diameters exceed 6 in. by pruning only small-branched trees as crop trees. Though pruning in stands where the prevailing diameters are less than 6 in. will reduce infection, no criteria were discovered which would help in selecting the trees least susceptible to decay. Thinning in dense young stands is likely to result in an increase of average branch size and thereby heighten the possibilities of infection. No heart rot was found in dissected trees less than 80 yr. old. Of the trees about 140 yr. old, 33 percent had an average of 7 lin. ft. of decay in the butt log.

Royas que atacan al álamo híbrido italiano "Arnaldo Mussolini" en el Delta del Paraná (Argentina) [Rusts attacking the Italian hybrid poplar "Arnaldo Mussolini" in the Parana Delta, Argentina], R. FRESA (*Rev. Argentina Agron.*, 8 (1941), No. 1, pp. 19-24, pls. 2, figs. 3).—*Melampsora larici-populina* and possibly *M. albertensis* were found on this introduced poplar. In morphological characters they correspond to those attacking native and Carolina poplars, respectively, in this area.

The watermark disease of willows.—II, Pathological changes in the wood, G. METCALFE (*New Phytol.*, 40 (1941), No. 2, pp. 97-107, pl. 1, figs. 4).—In further studies of this disease, associated with a bacterial complex (E. S. R., 84, p. 488), an abnormal type of protoplasmic degeneration is described which occurs in the ray cells of watermarked willow wood and in many other tissues, both diseased and healthy, and which is characterized by the appearance of large amounts of oil in the cell, together with a brown coloration. This degeneration is believed to be the usual result of a greatly disturbed physiology, which in this case is due to the presence of the bacteria. The staining is an oxidation product of catechol tannins or products of their break-down. Initiation of tylosis formation is connected with the presence of gas in the vessels.

Dissemination of fungi that stain logs and lumber, A. F. VERRALL (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 9, pp. 549-558).—Field studies indicated that the important fungi of log and lumber stain in the Gulf States are disseminated by air, insects, milling machinery, rain water, and infected wood. Most staining fungi are disseminated by various means, but those specifically associated with certain bark beetles were found to be carried chiefly by them. Although the common practice of dipping green lumber in toxic chemicals has greatly reduced the importance of most means of dissemination, that by bark beetles (inoculating logs under the bark) and by ambrosia beetles (inoculating logs and lumber deeply in the wood) remains of real importance. In infecting unprotected log ends and chemically treated lumber during adverse seasoning weather, spores carried by air currents and nonpenetrating insects are also to be reckoned with. The stain-control chemicals in common use apparently have no value as repellents to the important insect disseminators of the fungi concerned.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife management as a part of soil conservation, E. H. GRAHAM (U. S. Dept. Agr., *Soil Conserv. Serv.*, 1941, SCS-MP-23, pp. [3]+50).—This contribution, based on material given in the U. S. D. A. Graduate School, deals with the soil conservation movement (pp. 2-11), wildlife and soil conservation (pp. 12-16), and soil conservation practices beneficial to wildlife (pp. 17-33). It includes a list of the literature cited (pp. 37-50).

Wildlife Review, [January-December 1941] (U. S. Dept. Int., *Fish and Wildlife Serv.*, *Wildlife Rev. Nos.* 29 (1941), pp. 60; 30, pp. 46; 31, pp. 60; [32], pp. 62; 33, pp. 50).—A continuation of this series (E. S. R., 84, p. 213).

Duck food plants of the Illinois River Valley, F. C. BELLROSE, JR. (*Ill. Nat. Hist. Survey Bul.*, 21 (1941), Art. 8, pp. [3]+237-280, pl. 1, figs. 35).

Attwater's prairie chicken, its life history and management, V. W. LEHMANN (U. S. Dept. Int., *Fish and Wildlife Serv.*, *North Amer. Fauna* 57 (1941), pp. V+65, pls. 14, figs. 4).—This is a report of studies of the life history and habits of *Tympanuchus cupido attwateri*, a characteristic bird of the Texas coastal prairie closely related to the now extinct heath hen of northeastern North America. Important factors limiting the numbers of the bird include excessive or persistent rainfall during the nesting season, heavy grazing, excessive pasture burning, agricultural operations, and overshooting. Management will usually involve protection from excessive killing, improvement of food and cover, and control of predators and of the kill by hunters. Responsibility for this rests with the landowner. Optimum prairie chicken range apparently consists of well-drained grassland, with some weeds or shrubs, the cover varying in density from light to heavy, and with surface water available in summer. Diversification within the grassland type is essential. In the absence of ample

refuges for the species probably all other favorable factors together will fail to save Attwater's prairie chicken from extinction.

A list of 28 references cited is included.

The salamanders of New York, S. C. BISHOP (*N. Y. State Mus. Bul.* 324 (1941), pp. 365, figs. 66).—Following an introduction, part 1 of this work (pp. 11-17) deals with the identification of salamanders, their larvae and eggs, with keys to the species, larvae, recently hatched larvae, and the eggs. Part 2 (pp. 18-345) takes up the life history, habits, and distribution of New York salamanders, of which 17 forms are recognized. A bibliography of 14 pages is included.

An introduction to nematology (*Babylon, N. Y.: M. B. Chitwood, [1941], sect. 2, pt. 2, pp. [3]+243-372, figs. 38*).—The accounts presented in continuation of this work (*E. S. R.*, 84, p. 213) are: Life History—General Discussion, by B. G. Chitwood (pp. 243-245); Life History (Zooparasitica)—Parasites of Invertebrates, by J. R. Christie (pp. 246-266), and II, Parasites of Vertebrates, by A. C. Chandler, J. E. Alicata, and M. B. Chitwood (pp. 267-301); Epidemiology and Sanitary Measures for the Control of Nemic Parasites of Domesticated Animals, by T. W. M. Cameron (pp. 302-308); Epidemiology and Sanitary Measures for the Control of Nemic Parasites of Man, by W. W. Cort, E. B. Cram, and D. L. Augustine (pp. 309-331); Anthelmintic Medication for Nemic Disease of Domestic Animals and Man, by W. H. Wright and P. D. Harwood (pp. 332-349); Feeding Habits of Nematode Parasites of Vertebrates, by J. E. Ackert and J. H. Whitlock (pp. 350-355); and Chemical Composition and Metabolism of Nematode Parasites of Vertebrates and the Chemistry of Their Environment, by T. von Brand and T. L. Jahn (pp. 356-371). A copious bibliography accompanies each of the eight chapters.

[Entomological investigations by the New York State Station] (*New York State Sta. Rpt.* 1941, pp. 23, 27-32).—Progress is noted (*E. S. R.*, 84, p. 642) on spray materials and residues, fruit and vegetable insect investigations, and insects affecting ornamental and nursery plants.

The insect pest record for Oklahoma, 1940, F. A. FENTON. (*Okl. Expt. Sta.*). *Okl. Acad. Sci. Proc.*, 21 (1941), pp. 25-28).

A study of the bacteria associated with thirty species of insects, E. A. STEINHAUS. (*Ohio State Univ.*). (*Jour. Bact.*, 42 (1941), No. 6, pp. 757-790).—Eighty-three strains of bacteria, 2 of yeasts, and 2 molds isolated from 30 species of insects collected at Columbus, Ohio, representing 7 orders, were studied in the course of the investigation here reported. Of the 83 strains of bacteria isolated, 44 were Gram-negative short rods, 17 Gram-positive cocci, 10 Gram-positive short rods, and 12 were Gram-positive spore formers. According to genera, there were 7 strains of *Escherichia*, 10 *Aerobacter*, 2 *Aerobacter* or *Klebsiella*, 3 *Proteus*, 4 *Eberthella*, 1 *Serratia*, 3 *Pseudomonas*, 3 *Alcaligenes*, 2 *Achromobacter*, 8 *Flavobacterium*, 9 *Bacterium*, 8 *Micrococcus*, 1 *Sarcina*, 5 *Streptococcus*, 12 *Bacillus*, 2 *Corynebacterium*, 3 of unidentified bacteria, and 2 of unidentified yeasts and 2 molds, one each of the genera *Mucor* and *Aspergillus*. No Gram-negative cocci or true spirilla were cultured.

The majority of the insects examined were plant feeders. With the exception of a species of aphid, an occasional catalpa sphinx, and the bedbug, bacteria were found in the alimentary tract of every insect specimen examined. In most cases the species of bacteria in the several specimens of any given species of insect were surprisingly constant. There were at least 10 instances of duplication of specific strains of bacteria as they occurred in the different insect species.

A list of 17 references to the literature is included.

The artichoke plume moth and other pests injurious to the globe artichoke, W. H. LANGE, JR. (*California Sta. Bul.* 653 (1941), pp. 71, figs. 30).—Three overlapping generations of the artichoke plume moth occur annually in the coastal artichoke-growing areas of California, and all stages of this pest may be found during every month of the year. Oviposition occurs chiefly at night, and eggs are usually deposited singly and externally among the woolly hairs on the under side of the leaves. The time from egg deposition until emergence of the adult varied from 80 to 110 days. During the earlier stages the larvae feed on the tender interfolded leaves but later bore inside the leaf stalks or floral heads. Pupation usually occurs in the larval burrows inside the leaf stalks or on the outer bracts of the floral heads.

The parasite *Angitia platyptiliae* Cushman, parasitized from 2 to 90 percent of artichoke plume moth larvae during the period from 1936 to 1939. Predators noted include Staphylinidae larvae, spiders, mites, and the cliff swallow (*Petrochelidon lunifrons*).

Chemical control measures and light traps were not practical controls. Placing cut tops in ditches and covering with soil and burning plants shortly after cutting were found useful for the destruction of this insect.

Other pests mentioned as being associated with artichokes included the calendula plume moth *Platyptilia williamsii* Grin., several species of the genus *Oidaematophorus*, the artichoke aphid *Capitophorus braggii* (Gil.), bean aphid, ragwort or cineraria leaf miner *Phytomyza atricornis* Meig., greenhouse leaf tier, scabby sowbug *Porcellio scaber* Latr., *Lygus sallei* Stål, *Irbisia solani* Heid., *Peritelopsis globiventris* (Lec.), *Diabrotica 11-punctata* (Mann.) (*soror* Lec.), *Embolocia sauzalita* (Grt.), *Choreutis melanifera* Keifer, corn earworm, salt-marsh caterpillar, *Sabulodes caberata* Guen., painted lady, several tortricid larvae as well as other lepidopterous larvae, the thistle crown fly *Cheilosia baroni* Williston, *Paracantha culta* (Wied.), rodents, and slugs and snails. Mention is also made of the plant diseases affecting the artichoke, and a tabulation of all insects collected on the plant is included.

[Contributions on orchard pests] (*Md. Agr. Soc., Farm Bur. Rpt.*, 25 (1940), pp. 137-146, 155-161).—Contributions presented in this report are: New Methods of Codling Moth Control, by C. Graham (pp. 137-141); What Can the Orchardist do to Combat the Japanese Beetle? by G. S. Langford (pp. 141-144) (Univ. Md.); The European Corn Borer, by E. N. Cory (pp. 144-146) (Md. Expt. Sta.); and Using the New Methods for Peach Borer Control, by O. I. Snapp (pp. 155-161) (U. S. D. A.).

Methods used in rearing small insects infesting stored food products. N. E. HICKIN (*Roy. Ent. Soc. London, Proc., Ser. A*, 16 (1941), No. 4-6, pp. 35-38, figs. 4).

Avian hosts for malaria research, F. WOLFSON (*Quart. Rev. Biol.*, 16 (1941), No. 4, pp. 462-473).—It is concluded that of the four avian hosts available for malaria research in the United States (canary, chicken, pigeon, and duck), the duck is the most suitable. "Like the canary, the duck is susceptible to several species of *Plasmodium*, each of which produces a sufficiently severe and lasting infection to be useful for laboratory study. The chief advantages of the duck over the canary are its large size, low cost, and adequate supply. Unlike the duck, the chicken and pigeon are each susceptible only to one species of *Plasmodium* available in this country. Moreover, even *P. lophurae* produces a more severe and lasting infection in the duck than it does in the chicken. The vectors of *Plasmodium* residing in the pigeon are unknown, whereas the vectors of at least three species of *Plasmodium* residing in the duck are known. Only duck embryos are thus far known to be susceptible to species of *Plasmodium*

available in this country. Peking ducks are grown commercially in this country on a large scale. They can be bred throughout the year even on small general farms. The normal blood picture of ducks has been investigated and reported. The maintenance of ducks and duck embryos in the laboratory presents no difficulty. *Plasmodium* in duck tissues can be maintained successfully in culture." A list is given of 39 references to the literature.

Insect control important in increased crop production, G. F. KNOWLTON (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, p. 9, figs. 2).—A practical discussion.

Resistance of plants to insect attack, R. O. SNELLING. (U. S. D. A., III. Expt. Sta., et al.). (*Bot. Rev.*, 7 (1941), No. 10, pp. 543-586).—The subject matter of this monographic review (567 references) considers records and importance of host resistance, plant characteristics suggested as having an influence in resisting insect attack, and breeding plants to reduce insect damage, in each case with accompanying tabulated data.

Are population oscillations inherent in the host-parasite relation? P. DE BACH and H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Ecology*, 22 (1941), No. 4, pp. 363-369, fig. 1).

The effects of hosts upon their insect parasites, G. SALT (*Biol. Rev. Cambridge Phil. Soc.*, 16 (1941), No. 4, pp. 239-264, figs. 6).

The history of insecticides arranged as a chronological table, H. H. SHEPARD. (Minn. Expt. Sta.). (*Pests*, 9 (1941), No. 12, pp. 12-13).

Studies of contact insecticides.—XV, An insect toximeter, W. C. O'KANE, L. C. GLOVER, and R. L. BLICKLE (*New Hampshire Sta. Tech. Bul.* 76 (1941), pp. 10, figs. 4).—In continuation of these studies (E. S. R., 84, p. 360), a turntable apparatus, insect-holding device, and atomizers for spraying insects are described which assure even application on each individual insect and on all sides of the insects. The procedure for using this toximeter and parts is discussed, as well as specifications and plans for building it.

Problem of insecticide spray residue, A. J. COX (*Amer. Jour. Pub. Health*, 31 (1941), No. 11, pp. 1163-1168).

Spray retention: Amounts of arsenic and sulphur retained employing spray compositions, F. A. HERMAN (*Canad. Chem. and Process Indus.*, 25 (1941), No. 10, pp. 526-527, fig. 1).

The effect of carbon bisulphide on the germination of paddy, G. STAHEL (*Trop. Agr. [Trinidad]*, 18 (1941), No. 10, pp. 200-203).—Experiments are reported which show that the poisonous effect of carbon bisulfide vapor, used as an insecticide, on the germination of seed paddy depends closely on the water content of the latter, at least when it is between 9 and 16.5 percent. Air-dried paddy of 14 percent moisture content may be treated with the usual carbon bisulfide concentration for disinfecting purposes as long as 7 days without doing harm to germination. With 13 percent moisture content, even a 14 days' treatment is not harmful. Very dry paddy below 9 percent still germinates after a 14 days' treatment with saturated vapor or even with liquid carbon bisulfide.

Investigations on controversial points of fumigation methods, D. L. LINDGREN. (Univ. Calif.). (*Citrus Leaves*, 21 (1941), No. 7, pp. 5-6, 27).

Ability of the firebrat to damage fabrics and paper, J. AUSTIN and C. H. RICHARDSON. (Iowa Expt. Sta.). (*Jour. N. Y. Ent. Soc.*, 49 (1941), No. 4, pp. 357-365).—Report is made of an investigation of damage by the firebrat to 25 fabrics of 7 fibers (cotton, jute, linen, ramie, rayon, silk, and wool) and to three papers (two low ash filter papers and one medium typewriter bond). Medium typewriter bond paper, regenerated cellulose, either knitted or plain weave, and linen were the materials most heavily damaged. Cotton and silk were attacked if the

texture of the material was very suitable for feeding. The typewriter bond was the only one of the three papers tested that was seriously damaged. The significance of the ability of the firebrat to survive on these materials was tested statistically by comparing data for the survival period on the material with the survival data for the corresponding starvation control. The differences in the mean survival periods were significant for knitted regenerated cellulose and medium typewriter bond paper.

Barium compounds as poisons in firebrat baits, C. H. RICHARDSON and E. G. SEIFERLE. (Iowa Expt. Sta.). (*Pests*, 9 (1941), No. 9, pp. 22-25, fig. 1).—In experiments in which 26 barium compounds in a food mixture at 4 percent concentrations were tested for mortality to the firebrat 17 proved to be nontoxic or produced mortalities in 96 hr. of less than 25 percent. The most toxic compounds were barium fluosilicate and barium carbonate, followed by barium oxalate and then by barium peroxide and barium triphosphate. Description is given of a practical bait containing barium carbonate as the toxic ingredient.

Laboratory technique for the study of living termites, A. M. ADAMSON (*Ecology*, 22 (1941), No. 4, pp. 411-414).

Dinitro-ortho-cresol and other insecticides as locust poisons: Experiments of 1938-39, M. C. A. NOLTE (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 232 [1941], pp. 55).—This report relates to baiting, dusting, and spraying tests carried out in the laboratory and in the field with various materials, chiefly with preparations which contain 4,6-dinitro-*o*-cresol as the active principle, and with a few proprietary insecticides. Dusting tests showed that two proprietary insecticides (No. 3436 and K.3) as well as various dusts with 4,6-dinitro-*o*-cresol as the active principle were all particularly effective against both the red locust *Locustana pardalina* (Walk.) and the brown locust *Nomadacris septemfasciata* (Serv.) in the hopper as well as in the flying stage. The dosage per acre which was necessary to give favorable results varied according to circumstances and the method of application. The conclusion is that 30 lb. per acre of any of these dusts is sufficient to cause effective destruction of locust swarms, provided it is dusted evenly over the whole surface, e. g., by means of a cloud of dust which spreads out evenly. The most satisfactory and economical method of application appears to be by means of airplane dusting. Recommendations have been made for a large-scale experiment by means of airplanes. With a thorough, even distribution of the powder it is probable that less than 30 lb. (e. g., 20 lb.) per acre may prove to be adequate.

Grasshoppers and their effect on sagebrush on the Little Powder River in Wyoming and Montana, B. W. ALLED. (U. S. D. A.). (*Ecology*, 22 (1941), No. 4, pp. 387-392, figs. 3).

The relation of temperature to the embryonic and nymphal development of the differential grasshopper (*Melanoplus differentialis* Thomas), M. H. SWENK and C. H. BRATT (*Nebraska Sta. Res. Bul.* 122 (1941), pp. 24, figs. 9).—Temperatures from 80° to 85° F. were found the most favorable for successful development of eggs of the differential grasshopper. When high hatching percentage and rapid egg development were considered, 80° represented the optimum incubation temperature. Nymphal development varied directly with the temperature. Nymphs were sluggish at 60° and did not feed and failed to develop beyond the first instar. At 65° some nymphs fed and one reached the fourth instar, at 70° some reached the adult stage, and at 75° a fair number became adults. Development was completed in 48.5, 39.9, and 34 days at 80°, 85°, and 90°, respectively. Although there are normally six nymphal instars, a total of seven or eight were noted in several instances with temperatures of 85° or higher.

The plant bugs, or Miridae, of Illinois, H. H. KNIGHT (*Ill. Nat. Hist. Survey Bul.*, 22 (1941), Art. 1, pp. [6]+234, figs. 182).—This contribution deals with plant bugs of the family Miridae, which contains more than a third of the species of the order Hemiptera. Except for a few predaceous forms, they suck the juices from plant leaves and, with the leafhoppers, aphids, and scale insects, rank as one of the most important groups of plant-sucking insects in Illinois. Four hundred and forty species are treated, of which 110 are extralimital species, forms known from the entire general region in which Illinois is situated being included. Nineteen species are described as new.

Following a foreword by T. H. Frison and a brief introduction, the biology (pp. 2-5), distribution and habitat preference (pp. 5-12), economic status and control (pp. 12-15), and taxonomy (pp. 15-210) are dealt with. A host list (pp. 211-217), bibliography of five pages, and an index are included.

Notes on the orchid bug *Mertila malayensis* Distant on white mariposa (*Phalaenopsis amabilis* Blume), S. R. CAPCO (*Philippine Jour. Sci.*, 75 (1941), No. 2, pp. 185-195, pls. 2).—The capsid bug pest *M. malayensis*, which attacks the leaves, peduncles, and roots of orchid plants and especially *P. amabilis*, causing great damage, is recorded for the first time in the Philippines. It has been reported from Singapore, Burma, Bhamo, Java, Dutch East Indies, and India and to have been introduced into Germany. Feeding and oviposition punctures are responsible for the injury to the plants, causing the badly infested leaves to dry up and fall off.

Two approaches to the control of the potato leafhopper—insecticidal and varietal resistance, J. P. SLEESMAN. (Ohio Expt. Sta.). (*Ohio Veg. and Potato Growers Assoc. Proc.*, 26 (1941), pp. 74-76, 78).

The control of potato aphids on Long Island, J. O. NOTTINGHAM and W. A. RAWLINS. (Cornell Univ.). (*Amer. Potato Jour.*, 18 (1941), No. 11, pp. 305-311, fig. 1).—The use of nicotine spray and nicotine vapor has given excellent control of the potato aphid and the green peach aphid, which have frequently infested potato plantings on Long Island.

Yellow dwarf of tobacco in Australia.—II, Transmission by the jassid *Thamnotettix argentata* (Evans), A. V. HILL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 3, pp. 181-186).—Experiments have shown *T. argentata* to be a vector of yellow dwarf, a virus disease of tobacco in Australia. The minimum incubation period of the disease in the plant is 10 days.

A classification of the scale insect genus *Asterolecanium*, L. M. RUSSELL (*U. S. Dept. Agr., Misc. Pub.* 424 (1941), pp. 322, pls. 9, figs. 84).—The economic importance, geographical distribution, host associations, relationships, synonymy, characters used in classification, and species groups of the scales of the genus *Asterolecanium* are discussed. The genus, 83 new species, and all previously described species considered valid by the author are characterized. Mention is made of the 17 species unknown to the author. Keys are included to larvae and adult females. Photographs and drawings supplement the descriptive matter. One hundred references to the literature are cited.

Progress of the control of coconut-feeding Coccidae in Seychelles, D. VESEY-FITZGERALD (*Bul. Ent. Res.*, 32 (1941), No. 2, pp. 161-164).

Derris root infusion for sucking and biting lice of mammals, R. B. GAPUZ (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 4, pp. 389-393).—Infusions of crushed dry roots of *Derris* sp. varying in concentration from 0.6 to 5 percent were very effective for the destruction of sucking lice of carabaos and cattle. An infusion of crushed fresh roots of *D. philippinensis* with a strength of 2.5 percent, i. e., 250 gm. of crushed fresh roots steeped in 10 l. of water, was effective against biting lice of horses.

An ecological study of the forest tent caterpillar (*Malacosoma disstria* Hbn.) in northern Minnesota, A. C. HODSON (*Minnesota Sta. Tech. Bul.* 148 (1941), pp. [1]+55, figs. 6).—This report reviews outbreaks of the forest tent caterpillar in the United States and Canada, with particular reference to those since 1917. Recent outbreaks in Minnesota are described in detail. Hatching occurs from May 5 to 25. From 5 to 6 weeks elapse from the hatching date to the appearance of cocoons. The prepupal stage lasts about 2 days and the pupal from 8 to 12 days. Moths were active in the field for about 2 weeks (July 5–20). The quantity of food eaten during larval development and the production of frass are discussed. It is pointed out that frass collections might be used for the determination of populations. Larvae were unable to pupate when without food during the last instar. Adult females that developed from larvae which fed half the usual feeding time during the last instar contained an average of 97 eggs as compared with 172 for controls. Methods for estimating populations are described. Samples of egg bands were found valuable in measuring the total population in an area. No single natural factor was found entirely responsible for reduction in numbers of forest tent caterpillars. For example, in one area high summer temperature was important, in another spring frost was destructive, and in the third parasites exhibited an unusual degree of efficiency. Other factors contributed in all cases. Some possible regulating factors influencing the cyclic behavior of populations and a theory of the possible origin of parallel fluctuations in numbers in separate localities are mentioned.

Two new methods of trapping the cacao [almond] moth (*Ephestia caudata*), F. D. GOLDING (*Bul. Ent. Res.*, 32 (1941), No. 2, pp. 123–132).

Revision of the North American moths of the family Oecophoridae, with descriptions of new genera and species, J. F. G. CLARKE (*U. S. Natl. Mus. Proc.*, 90 (1941), No. 3107, pp. 33–286+VIII, pls. 48).—This is a revision of a family (Oecophoridae) that comprises a large group of small to medium-sized moths, most of which are inconspicuously colored but a few are brilliantly marked. The majority of the forms are leaf and flower feeders in the larval stage, and those that feed in the inflorescence usually attack plants of the family Umbelliferae, while the leaf feeders attack a large variety of plants in many families. Some are forest pests. Aside from these leaf and flower feeders, there are others that feed on stored products such as dried foods, bulbs, and tubers. Some are scavengers and feed in the refuse occurring in the nests of mice and birds. Some live in the cracks of bark, others beneath the bark where they feed either on refuse or bits of dried vegetable matter. One (*Martyrhilda sphaeralceae* n. sp.) is a leaf miner. Twenty-two genera and 117 North American species are recognized, of which 6 genera are erected and 19 species and 1 race described as new.

The sugarcane borer, J. W. INGRAM and E. K. BYNUM (*U. S. Dept. Agr., Farmers' Bul.* 1884 (1941), pp. II+17, figs. 5).—The latest available information on sugarcane borer control is summarized in this publication. Practical control measures suggested include: Clean up pieces of millable cane during harvesting operations to eliminate overwintering borers; burn trash and large grasses as soon as these are sufficiently dry after harvest; cut low when harvesting cane to decrease number of borers overwintering in cane stubs; if possible, flood fields for 3 or 4 days after harvest; select seed cane free from borers when possible; soak seed cane 72 hr. before planting when practical; if agronomically practical, plant resistant variety Co. 290 in areas of heavy infestation and refrain from planting susceptible varieties, C. P. 29/116 and C. P. 29/103.

A summary of recent investigations of sugarcane borer control with cryolite and other insecticides, J. W. INGRAM and A. L. DUGAS. (U. S. D. A. Coop. La. Expt. Sta.). (*Sugar Bul.*, 20 (1941), No. 4, pp. 27-29).

Two new species of cecidomyiid flies from phlox, C. T. GREENE (*U. S. Natl. Mus. Proc.*, 90 (1941), No. 3120, pp. 547-551, fig. 1).—*Hyperdiplosis phlox* and *Lestodiplosis maculipennis*, both reared at the Ohio Experiment Station from phlox that had been severely damaged, are described as new. It is pointed out that in experiments conducted by C. R. Neiswander with phlox the former was found to be responsible for the injury, but that *L. maculipennis* is undoubtedly a predator on *H. phlox*.

New Jersey Mosquito Extermination Association, twenty-seventh [and twenty-eighth annual meetings held at Atlantic City, N. J.] (*N. J. Mosquito Extermin. Assoc. Proc.*, 27 (1940), pp. [2]+203+[3], pls. 9, figs. 10; 28 (1941), pp. 211+[3], pls. 8, figs. 13).—Among the contributions presented at the twenty-seventh meeting (E. S. R., 82, p. 653) held in March 1940 are the following: The Relation of Mosquitoes to Diseases of Man and Animals in New Jersey, by T. J. Headlee (pp. 5-11) (N. J. Expt. Stas.); The Relation of Mosquitoes to Equine Encephalomyelitis in Massachusetts, by P. J. Jakmauh (pp. 12-18); A Review of Contributions Made Throughout the World in 1939 to the Knowledge of Mosquitoes, by F. C. Bishopp and J. L. Webb (pp. 19-35) (U. S. D. A.); Control of Mosquitoes at the New York World's Fair, by J. G. Grimley and H. L. Felton (pp. 102-105); and Tidal Inundation as a Factor Limiting the Distribution of *Aedes* spp. on a Delaware Salt Marsh, by W. A. Connell (pp. 166-177) (Del. Sta.).

Among those at the meeting in March 1941 are the following: New Jersey Mosquito Problems, by T. J. Headlee (pp. 7-12), Distribution of *Aedes vexans* Eggs, by C. Filsinger (pp. 12-19), Studies of the Effect of Reduction of Surface Tension on Mosquito Pupae, by M. A. Manzelli (pp. 19-23), Mosquito Control in New Jersey in 1940 and Its Contributions to National Defense, by T. D. Mulhern (pp. 72-114), and The Present Status of Knowledge on Mosquito Oils and Larvicides, by J. M. Ginsburg (pp. 135-143) (all N. J. Stas.); A Review of Contributions to Knowledge of Mosquitoes During 1940, by F. C. Bishopp and J. L. Webb (pp. 24-38), and Comparative Resistance of Several Species of Mosquitoes to Larvicides (pp. 119-126) and Factors That May Affect the Toxicity of Pyrethrum-Oil Emulsions as Mosquito Larvicides (pp. 127-135), both by H. H. Stage and W. W. Yates (all U. S. D. A.); A Brief Account of the Malaria Epidemic at Ithaca (1904-1907), by R. Matheson (pp. 162-165) (Cornell Univ.); Mosquito Suppression Work in Canada in 1940, by A. Gibson (pp. 167-176); *Mansonia perturbans* (Walk.) on Cape Cod, by R. L. Armstrong (pp. 184-188); and Report on the Delaware County Mosquito Extermination Commission for 1940, by J. F. Conner and J. H. Spackman (pp. 201-204).

Flies as carriers of poliomyelitis virus in urban epidemics, A. B. SABIN and R. WARD (*Science*, 94 (1941), No. 2451, pp. 590-591).—In the search for carriers of the poliomyelitis virus under way but not completed, three positive findings have been obtained with flies caught during outbreaks—two from lots representing several species caught in urban sites in Cleveland, Ohio, and one with a small number of flies caught in Atlanta, Ga. This confirms the finding of Paul and his associates (E. S. R., 86, p. 362).

Seasonal occurrence and the effect of host attractiveness on the abundance of stable flies and horn flies on cattle, T. H. MAILEN. (Okla. A. and M. Col. et al.). (*Okla. Acad. Sci. Proc.*, 21 (1941), pp. 19-21, fig. 1).—Field experiments indicate that on account of the extreme variation in the attractiveness of different animals to stableflies and hornflies and also additional evidence of

the difference in attractiveness of a single animal at different periods it is impossible to use unsprayed animals as checks in determining the effects of fly sprays.

Siphonaptera: The genera *Amphalius* and *Ctenophyllus* in North America, W. L. JELLISON (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 49, pp. 2341-2349, figs. 2).—Two genera of fleas that are characteristic parasites of pikas (*Ochotona* spp.), which include the smallest members of the order Lagomorpha, are considered.

The Japanese beetle problem, especially as it affects the vegetable industry, J. W. BARRINGER (*Ohio Veg. and Potato Growers Assoc. Proc.*, 25 (1940), pp. 67-74).

Tasmanian grass-grubs, J. W. EVANS (*Tasmania Dept. Agr. Bul.* 22, n. ser. (1941), pp. 23, figs. 7).—Three species of grass grubs of the lepidopterous genus *Oncopera* that are pasture pests in Tasmania are considered, namely, *O. intricata* Walk., *O. rufobrunnea* Tindale, and *O. intricoides* Tindale, of which the last two mentioned also occur on the Australian mainland. The larvae are subterranean and feed at night on surface vegetation.

Studies in population physiology.—X, Interspecific competition in populations of granary beetles, T. PARK, E. V. GREGG, and C. Z. LUTHERMAN (*Physiol. Zool.*, 14 (1941), No. 4, pp. 395-430, figs. 14).—In further work (E. S. R., 82, p. 83) in which the authors attempted to analyze experimentally the effect of interspecific competition on population growth, *Tribolium confusum*, *Gnathocerus cornutus*, and *Trogoderma versicolor* were used. The following general conclusions describing the end result of the competition are listed: "If *Tribolium* gets well established as a population it drives out *Gnathocerus*. If *Tribolium* populations are reduced to a low point by some type of epidemic infection (or, presumably, some other mechanism), *Gnathocerus* gets the upper hand and *Tribolium* becomes extinct. *Tribolium* always drives out *Trogoderma*, irrespective of initial imaginal densities. *Gnathocerus* usually drives out *Trogoderma*. This is true if the former is seeded initially in equal or higher densities. *Trogoderma* is the winner when started in a higher density than *Gnathocerus*." A list of 22 references is included.

Losses of bees from poisons in Utah, J. I. HAMBLETON (*Gleanings Bee Cult.*, 69 (1941), No. 11, pp. 685, 731).

Moth pests of honeybee combs, V. G. MLUM. (Univ. Ill.) (*Ill. State Beekeepers' Assoc. Ann. Rpt.*, 40 (1940), pp. 113-128, figs. 9).

The wheat jointworm in Oregon, with special reference to its dispersion, injury, and parasitization, T. R. CHAMBERLIN (*U. S. Dept. Agr., Tech. Bul.* 784 (1941), pp. 48, figs. 6).—This discusses the biology, parasitization, injury, control, and dispersion of the jointworm in the Willamette Valley of Oregon. First found in 1926, original infestations were heavy but had declined to 3 percent or less by 1934. The average yearly spread was slightly more than a mile. Adults emerged from stubble between April 5 and May 19. Eggs were largely deposited in the second and third joints of wheat. Fall and winter or early wheats were preferred for oviposition. It was estimated that each female had an average capacity of 90 eggs. Females constitute approximately 60 percent of the population. Jointworms reduced the size and number of kernels per head.

Parasitization studies indicated that if parasites reduced the theoretical effective rate of reproduction from 54 to 1 to 35 to 1 or less, other factors were sufficient to put the jointworm population on a descending scale. Parasites discussed included *Eurytoma parva* Phillips, *Ditropinotus aureoviridis* Cwfd.,

Eupelmella vesicularis (Retz.), *Eupelmus allynii* (French), *Calosota metallica* Gahan, *Decatoma amsterdamensis* Gir., and *Eurytoma phoebus* Gir.

Most jointworms in fall-buried stubble in the Willamette Valley die before the normal emergence period. It is pointed out that the planting of red clover in winter barley or winter oats rather than wheat permits farmers to plow under wheat stubble. Wheat should be planted as far as possible from the old stubble in those instances where this has not been plowed. Controlled burning of wheat stubble kills many jointworms.

New braconid parasites of *Antestia lineaticollis* Stål and of *Sylepta derogata* F., G. E. J. NIXON (*Bul. Ent. Res.*, 32 (1941), No. 2, pp. 93-101, figs. 19).—Of the seven African forms of the genus *Aridelus* (*Helorimorpha*), including one species described as new, three are parasites of the important hemipterous coffee pest *A. lineaticollis*. The genus *Benama*, of which *B. hutsoni* n. sp., probably belonging to the subfamily Diospilinae, is the type, is erected. This new species is a parasite of the cotton leaf roller *S. derogata*.

ANIMAL PRODUCTION

Nutritive value for ruminants of proteins in common feeding stuffs, F. B. MORRISON and J. I. MILLER. (Cornell Univ.). (*Internat. Rev. Agr. [Roma]*, 32 (1941), No. 9, pp. 303T-309T).—Either the requirements of ruminants for essential amino acids differ from those of nonruminants or the ruminants have the ability to synthesize essential amino acids. These conclusions were derived from the completeness of certain plant proteins for ruminants as contrasted with nonruminants. Although urea nitrogen as practically the sole supply of nitrogen promoted little gain in lambs, it maintained a positive nitrogen balance. Hasty legislation to permit the use of urea in mixed feeds was not recommended. Little difference was found in the biological values of proteins from raw and heated soybean meal for lambs as contrasted with nonruminant studies. In feeding experiments it seemed important to furnish a good-quality protein to high-producing milk cows if maximum production is to be maintained.

The carotene content of certain species of grassland herbage, A. M. SMITH and T. WANG (*Jour. Agr. Sci. [England]*, 31 (1941), No. 3, pp. 370-378, fig. 1).—Stage of growth was the predominant factor in determining both N and carotene in the 63 samples of white clover, orchard grass, ryegrass, and timothy examined. A relationship of N content to carotene was noted, and the carotene content increased with N fertilization. Except for ryegrass, there was more carotene in the leaves and stems than in the heads or flowers.

Mycostatic salts prevent mold growths on stored foods, W. L. MALLMAN. (Mich. Expt. Sta.). (*Food Indus.*, 13 (1941), No. 7, pp. 41-42, 54).—The use of salts for treatment of containers or wrappings for vegetables with substances inhibiting mold growth in storage, as in the case of eggs (E. S. R., 84, p. 661; 86, p. 79), is suggested.

Inspection of feeds, E. J. DESZYCK, T. WRIGHT, JR., and R. L. SWALLOW (*Rhode Island Sta. Feed. Cir.*, Sept. 1941, pp. 77).—The usual report on the guaranteed and found analyses of feed officially examined in connection with the Rhode Island feed law (E. S. R., 84, p. 373).

The minimum base value of heat production in animals, E. B. FORBES and R. W. SWIFT. (Pa. State Col.). (*Science*, 93 (1941), No. 2426, pp. 623-624, fig. 1).—Dynamic effects of nutrients observed at planes of nutrition below that of energy equilibrium were shown by examples of heat production by steers to be fundamentally invalid. The heat production showed a nearly straight-line relation to dry-matter consumption above a minimum level.

Īzmerenie rosta i skorospelosti zivotnykh] (Measuring of growth and early maturity in animals), N. N. KOLESNIK (*Akad. Nauk S. S. S. R., Trudy Īnst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 5-42, figs. 7; Eng. abs., pp. 40-42*).—A mathematical consideration of growth and maturity in animals.

The relative net energy values of alfalfa hay and corn grain and of sorghum fodder and alfalfa hay as determined by feeding experiments with fattening lambs, F. H. LEINBACH (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 419-421*).—The net energy value of alfalfa hay and sorghum fodder fed in heavy, medium, and light rations with corn to groups of lambs in two experiments was calculated as 33.86 and 33.11 therms, respectively, per 100 lb. The need for a uniformity of finish of the livestock is emphasized if results of feeding experiments are to be used for determination of relative net energy values. The revised value for alfalfa was similar to that calculated from respiration calorimetric studies with cattle by Forbes et al. (*E. S. R., 62, p. 656*).

The use of lamb fattening experiments in determining the relative net energy values of distillers' corn dried grains and brewers' dried grains in comparison with corn grain, G. M. CAIRNS (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 412-414*).—Employing methods of Morrison (*E. S. R., 79, p. 664*), the author found that the net energy values of distillers' corn dried grains and brewers' dried grains in comparison with shelled corn when calculated in two experiments with lambs showed sufficient differences to warrant repetition before drawing final conclusions.

Traits that determine the efficiency of the pig as a transformer of energy, E. G. RITZMAN and N. F. COLOVOS (*New Hampshire Sta. Tech. Bul. 75 (1941), pp. 29, fig. 1*).—The pig is shown to possess an extraordinary superiority over cattle and sheep in the proportion of digestible food energy that is stored. This was shown to be due to a more labile adaptation to environmental conditions. Data are presented in this study on the basal metabolism of 19 individual pigs ranging in age from 10 days to 3 yr. and from 3 to 200 kg. in weight with frequent comparisons with cattle and sheep reported in other studies. Basal metabolism studies showed that heat production of a boar was about 20 percent higher than that of two adult sows. By castration, heat production was reduced an average of 34 percent in the pig, as compared with 17 percent in sheep. Pregnancy and lactation in the sow increased the metabolism rate from 13 percent at 5.5 weeks of gestation to 76 percent 1 week after parturition. Seasonal variations were noted in the basal metabolism of the sow, so that there was a drop from about 18.4 calories per kilogram of weight per 24 hr. in the winter to below 15 in the hot summer months in spite of a uniform environmental temperature under which metabolism was ascertained.

Vitamin A and D and protein supplements for growing and fattening fall pigs in dry lot, L. E. HANSON (In *Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 417-418*).—The standard ration of yellow corn and trio mixture was not improved in dry-lot feeding of swine by the addition of cod-liver oil or fortified cod-liver oil, suggesting that the ration was not deficient in vitamins A or D. Standard wheat middlings could be substituted for corn and tankage if the price differential made it worth while. Good alfalfa hay or some legume hay seemed essential for best results.

Riboflavin deficiency in the pig, A. J. PATEK, JR., J. POST, and J. VICTOR (*Amer. Jour. Physiol., 133 (1941), No. 1, pp. 47-55, figs. 2*).—Pigs on a ration low in riboflavin developed characteristic changes of the eyes, coat, and gait and symptoms of anemia with ultimate collapse, all of which were prevented by supplementing the ration with 2.5 mg. daily of riboflavin per kilogram of weight.

The four pigs on the deficient ration consumed feed well until a day or two before collapse or death. Perhaps some of the changes observed in these animals, i. e., spastic paralysis, anemia, and possibly adrenal hemorrhages, resulted from a lack of other food products.

A study of the nutritional value of wheat germ products for swine, E. W. CRAMPTON (*Sci. Agr.*, 21 (1941), No. 12, pp. 750-758).—Supplementing the rations of eight sows with wheat germ during the latter part of the gestation period and lactation had no measurable influence on the birth or weaning weights of the pigs produced. Additions of wheat germ to the ration of fattening pigs caused an increase in the feed consumption of 8.5 percent and in live weight gains of 10 percent. Wheat-germ oil had no effect on growth of the pigs, and neither wheat product affected carcass quality.

Meeting the vitamin D requirement of pigs with alfalfa hay and winter sunshine, D. W. JOHNSON and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 11, pp. 639-648).—A rachitic condition produced in pigs by including in the ration 5 percent of alfalfa hay containing 0.39 International Unit of vitamin D per gram was cured by a ration containing 5 percent of another alfalfa hay with 1.46 I. U. of vitamin D per gram. A ration containing 0.85 I. U. prevented but did not cure rickets. Rickets in pigs was cured by exposure to 45 min. per day to January or February sunshine for 2 weeks, although pigs fed indoors and allowed voluntary access to sunlight developed rickets. In arriving at the above conclusions, the authors conducted three experiments in feeding groups of pigs on normal swine rations containing 5 percent of alfalfa with irradiated and unirradiated yeast. The alfalfa hays contained 0.15, 0.39, 0.85, and 1.46 I. U. of vitamin D per gram. With the onset of rickets there was a decrease in the Ca per 100 cc. of blood plasma from about 11 to approximately 7 mg. The influence of varying amounts and ratios of Ca and P on the requirement of vitamin D was also investigated.

Jackstock production in Mississippi, R. H. MEANS (*Mississippi Sta. Bul.* 363 (1941), pp. 23, figs. 11; *abs. in Miss. Farm Res.* [Mississippi Sta.], 4 (1941), No. 10, pp. 3-6, figs. 11).—A brief account of jack production in Mississippi, including 4-yr. studies on costs, feed consumption, breeding, and growing the jacks and jennets. "The harvested feed cost of maintaining mature jennets for 1 yr. ranged from \$15 to \$25, depending upon the foaling date. The maintenance cost of jennets that foaled in the fall was considerably greater than for those that foaled in the spring. The jennets at breeding age represent a harvested feed cost of approximately \$35, with grain charged at \$1.50 per hundred and hay at \$10 per ton. The jacks produced in this study each consumed approximately 2.5 tons of grain and 2.75 tons of hay to breeding age or 3-year-olds. The harvested feed cost was slightly more than \$100 per jack. . . . The breeding records reported indicate that jennets are harder to get settled in foal than mares. Under the conditions of this experiment it was necessary to breed jennets on an average of 4.8 heat periods to produce one foal."

Canned fish as a meat substitute in the summer mink ration, C. F. BASSETT (*Amer. Fur Breeder*, 14 (1941), No. 6, pp. 38-40).—In four experiments, one-third to one-half of the 40 to 45 percent of raw meat in kit and adult mink rations was satisfactorily replaced by canned ocean whiting. Pelt quality, growth, and mortality were not significantly affected by the substitution.

[Abstracts of papers presented at the 33rd annual meeting of the Poultry Science Association—August 12-15, 1941, Stillwater, Oklahoma] [*Poultry Sci.*, 20 (1941), No. 5, pp. 454-478].—Papers relating to poultry production and management are as follows (see p. 461 for papers on poultry genetics): The Effect of Dietary Protein Supplements on the Toxicity of Sclen-

iferous Grains for the Chick, by H. D. Anderson, W. E. Poley, and A. L. Moxon (p. 454) (S. Dak. Expt. Sta.); The Effect of Unabsorbed Yolks in Two-Week-Old Pullet Chicks on Subsequent Performance, by G. E. Bearse and C. F. McClary (p. 455) (West. Wash. Sta.); The Relation of Riboflavin to Growth and Paralysis in Chicks, by R. M. Bethke and P. R. Record (p. 456) (Ohio Sta.); Vitamin A Requirements of Growing Chicks—III, Effectiveness of Ester and Free Forms of Vitamin A in Dog Fish Liver Oil, by J. Biely, J. Pratt, and W. Chalmers (p. 456) (E. S. R., 76, p. 676); The Riboflavin Requirement of Turkeys for Hatchability, by R. V. Boucher, F. W. Hill, H. Patrick, and H. C. Knandel (pp. 456-457) (Pa. State Col.); Fat Absorption in the Laying Hen, by R. M. Conrad and H. M. Scott (p. 458) (Kans. State Col.); The Effect of Alfalfa Leaf Meal and Dried Cereal Grass on Hatchability and Egg Production, by W. W. Cravens and C. E. Holmes (p. 458) (Univ. Wis.); Cannibalism in White Leghorn Pullets in the Laying House, by J. A. Davidson, P. J. Schaible, A. W. Brant, and C. G. Card (p. 458) (Mich. State Col.); Studies on the Fat Requirements of the Domestic Fowl, by H. J. Davis and C. W. Upp (p. 459) (La. State Univ.); A Rapid Method of Scoring Body Conformation in Poultry, by R. L. Dolecek, W. O. Wilson, and W. E. Poley (p. 459) (S. Dak. State Col.); The 365-Day Egg Production Equivalent Table, by H. Embleton (p. 460) (Univ. Ariz.); Studies on Stability of Vitamin D, by J. C. Fritz, W. F. Archer, and D. K. Barker (p. 460); The Need for Pantothenic Acid and an Unidentified Factor in Reproduction in the Domestic Fowl, by M. B. Gillis, G. F. Heuser, and L. C. Norris (p. 460) (Cornell Univ.); Interference of Heated Diets on Calcification in Chickens, by J. C. Hammond, H. E. McClure, and D. Miller (p. 461) (U. S. D. A.); The Comparative Vitamin D Requirements of White Leghorn and Crossbred Chicks, and A Study of Methods for the Biological Assay of Vitamin D Supplements, both by V. Heiman and L. W. Tighe (pp. 461-462); Minerals in Rations of Battery Brooded Chicks, by V. G. Heller and R. Penquite (p. 462) (Okla. Sta.); Studies in Egg Quality—Interior Quality of Eggs as Indicated by Albumen and Yolk Indices, Yolk Color, Shell Thickness, Egg Shape, and Differences in Breeds and Strains for Same in Barred Plymouth Rocks, Rhode Island Reds, and White Leghorns, by W. Henderson, M. Narod, G. Cook, and E. A. Lloyd (pp. 462-463); The Feeding of Corn Cockle to Chickens, by G. F. Heuser and A. E. Schumacher (p. 463) (Cornell Univ.); Modifications in the Chick Vitamin D Assay Procedure, by S. R. Johnson (p. 464) (Ark. Sta.); Evidences of New Growth Factors for Chicks, by E. L. Johnson, C. W. Carrick, R. E. Roberts, and S. M. Hauge (p. 464) (Ind. Sta.); Growth of Turkey Poults on Simplified Diets, by T. H. Jukes (p. 464) (Univ. Calif.); The Effect of a Saline Extract of the Anterior Pituitary on Vitamin A and Fat Metabolism in the Fowl, by W. A. Maw and N. Nikolaiczuk (p. 466); Limited Range for Growing Turkeys, by T. T. Milby and R. B. Thompson (p. 467) (Okla. Sta.); "Gizzard Lesions in Day-Old Chicks," by D. Miller and H. W. Titus (p. 468) (U. S. D. A.); The Study of Calcium Metabolism in the Laying Hen by the Comparative Slaughter Method, by C. L. Morgan, J. H. Mitchell, R. C. Ringrose, and E. J. Lease (p. 468) (S. C. Sta.); Protein Utilization by the Growing Poult, by F. E. Mussehl, C. W. Ackerson, and R. H. Thayer (p. 469) (Univ. Nebr.); Further Evidence on the Cause and Occurrence of Blood and Meat Spots, by A. V. Nalbandov and L. E. Card (p. 469) (Univ. Ill.); Cane Molasses as a Constituent of Rations for Growing Fowls, by W. H. Ott, R. V. Boucher, and H. C. Knandel (p. 470) (Pa. State Col.); Influence of Height and Location of Feed and Water Containers on Egg Production of Single Comb White Leghorn Fowl, by R. Penquite and W. Land (pp. 470-471) (Okla. A. and M. Col.); Preliminary Observations on Choline in

Chick Nutrition, by P. R. Record and R. M. Bethke (p. 471) (Ohio Sta.); The Response of Poults From Turkey Hens Fed Different Levels of Vitamin D, by E. I. Robertson, M. Rhian, and L. A. Wilhelm (p. 471) (Wash. Sta.); Studies on Detection of Fertility in Fresh Dissected Eggs by Radio Frequency, by A. L. Romanoff (pp. 471-472) (Cornell Univ.); Egg Quality Studies With the Storrs Contest Hens, by H. M. Scott (p. 472) (Univ. Conn.); Carotene Destroying Power of Certain Animal Feeds, by R. M. Sherwood and G. S. Fraps (p. 472) (Tex. Sta.); The Effect of Green Feed Supplement on Chick Growth, by R. M. Smith and S. R. Johnson (p. 473) (Ark. Sta.); Poisoning of Turkey Poults From Milkweed (*Asclepias galioides?*), by G. W. Stiles (pp. 473-474) (U. S. D. A.); Chloride Content of Blood of 11-Day Chick Embryos, by P. D. Sturkie (p. 474) (Cornell Univ.); The Effect of Heat on the Growth Promoting Value of a Specific Ration for Chicks, by R. H. Thayer and F. E. Mussehl (pp. 474-475) (Univ. Nebr.); Gizzard Erosion and Feathering in Chicks as Influenced by the Diet, by J. N. Thompson and H. L. Wilcke (p. 475) (Iowa State Col.); The Iodine Requirements of Growing Chickens, by H. S. Wilgus, Jr., G. S. Harshfield, A. R. Patton, L. P. Ferris, and F. X. Gassner (p. 477) (Colo. Sta.); and Physical Measurements of Fattening and Fleshing in Chickens, by W. O. Wilson, R. L. Dolecek, and A. L. Moxon (p. 477) (S. Dak. State Col.).

Institutional poultry work in a poultry deficient State, C. W. UPP. (La. State Univ.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 1, pp. 25-26, 61-62).—A review of extension and research work on poultry is given.

Studies of calcium and phosphorus metabolism in relation to the chemical structure of bone.—II, Experiments with moulting birds, C. TYLER (*Biochem. Jour.*, 34 (1940), No. 10-11, pp. 1427-1430, fig. 1).—In continuation of this series (E. S. R., 83, p. 811) on the Ca and P exchanges in two molting hens receiving supplements of calcium gluconate or calcium carbonate, it is shown that the changes in the Ca of the $\text{Ca}_3(\text{PO}_4)_2$ and residual Ca of bone were similar in molting to the changes taking place in the normal laying birds described in the previous study. One hen 31 days in molt showed the same reciprocal relationship between changes in $\text{Ca}_3(\text{PO}_4)_2$ and residual Ca of the bone as in the laying hens.

The study of the respiratory behavior of individual chicken embryos, A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta. et al.). (*Jour. Cell. and Compar. Physiol.*, 18 (1941), No. 2, pp. 199-214, figs. 7).—The oxygen consumption of chicken embryos per unit of weight was found to decline with increasing age. Individual variations in respiration were associated with differences in morphological age at the first and second days of incubation, incidence of mortality on the fourth, thirteenth, and nineteenth days, and increased functional and physical activities with hatching on the twenty-first day. The respiration of some morbid embryos was below normal on the fourth and fifth days before death, and there was a reduction of as much as 60 percent on the day before death. A correlation of 0.896 ± 0.028 was found between the body weight on the day of death and the amount of oxygen consumed on the day before death. It was evident that the oxygen consumption could be used in the detection of morbid embryos before their death.

Observations on the mineral metabolism of pullets.—V, Acid-base equilibrium and reproductive activity, R. H. COMMON (*Jour. Agr. Sci. [England]*, 31 (1941), No. 3, pp. 281-294, figs. 8).—Further study in continuation of the series (E. S. R., 83, p. 811) on the calcium balances and alkali reserves of seven pullets and one cockerel on cereal rations with and without supplements of calcium carbonate showed a prelaying increase in the alkali reserve of the blood

and the maintenance of a high level of the alkali reserve during laying when the high-calcium supplement was added to the ration. The alkali reserves of a cockerel did not show the fluctuations which preceded laying in the pullets. An increase of apparent digestibility of phytic acid phosphorus due to calcium metabolism of shell formation only became pronounced when birds on a high-calcium carbonate intake began laying intensely.

Sunlamps for poultry, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 213 (1941), pp. 177-182, fig 1*).—Results based on growth, hatchability, and egg production equal to or slightly better than, those secured from feeding vitamin A and D oil were obtained by 1-7 hr. of daily exposure to the S-4 Type sun lamp (E. S. R., 84, p. 804). Although exposure for 1 hr. daily was sufficient for egg production and hatchability, more time was recommended pending final conclusions from further studies.

A review of egg legislation in the United States, R. L. BUTLER, L. A. WILHELM, and R. B. THOMPSON. (Okla. Expt. Sta.). (*U. S. Egg and Poultry Mag., 47 (1941), No. 12, pp. 730-733*).—Suggestions are presented for inclusion in egg marketing legislation and regulations.

Ducks and geese, J. K. LIPSCOMB and H. HOWES (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 70 (1941), 3. ed., pp. [4]+37, pls. 6*).—This revision (E. S. R., 71, p. 829) includes a section on ducks for egg production.

Turkey work at Oklahoma A & M, T. T. MILBY (*U. S. Egg and Poultry Mag., 48 (1942), No. 1, pp. 22-24, figs. 7*).—Research in nutrition, management, breeding, and marketing of turkeys, including a description of the physical plant and teaching and service work, is briefly noted.

DAIRY FARMING—DAIRYING

Report of the Chief of the Bureau of Dairy Industry, 1941, O. E. REED (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1941, pp. 51*).—From dairy cattle investigations at the Beltsville, Md., Research Center and field experiment stations, results are briefly reported on progress in purebred dairy cattle improvement through breeding, colostrum injection as a skin test for pregnancy, various anatomical relationships in cattle and their relation to producing ability, the significance of mammary veining and the course of venous circulation of the udder, production costs and nutritive values of roughages including grazing crops, naturally cured and artificially dried hays and silages, the reaction of cattle to climatic conditions, and the value of applying liquid manure to pastures.

Reports from the division of nutrition and physiology include data on the determination of hydroxyamino acids in milk and the chemical reaction of amino acids; a study of unidentified nutritive factors in cow's milk; the vitamin A requirements of very young calves; the effect of cod-liver oil feeding on the fat content of milk; methods for determining carotene in hays, silages, and green forage; gonad-stimulating materials in plants; and various endocrine relationships in reproduction and lactation.

Reports of dairy products research dealt with the chemistry and bacteriology of milk, including the vitamin requirements of bacteria; the use of abrasives in the disintegration of bacterial cells; the composition of milk fat; causes of fat deterioration; structure of milk proteins; the heat stabilization of milk; factors affecting and methods for controlling the whipping properties of ice cream mixes; the utilization of dairy byproducts, including casein fiber, lactic acid lacquers, and riboflavin recovery from whey; cheese investigations, particularly the pasteurization of milk for Cheddar cheese; milk quality and clarifica-

tion of milk as related to quality in Swiss cheese; the development of a cheese containing all the solids of milk; and the relation of quality to consumption of cheese.

From market milk investigations results are noted on the chloride and leucocyte content of milks produced by hand milking and by machine milking, the detection of added cow's milk in goat's milk, the effect of fat content and of homogenization temperature on the curd tension of milk, various factors affecting flavor in homogenized milk, and a summary of milk plant management surveys. The recently approved score cards for milk and cream and ice cream also are described.

Dairy products for defense, A. J. MORRIS (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, pp. 7-8).—Production goals for dairy products are outlined. The need for production of high-quality products suitable for defense needs is stressed.

[Dairy investigations in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 11, p. 5).—Brief progress reports are presented for studies on the bitter principle imparted to milk when cows consumed bitterweed and the control of this weed in pastures, the efficiency of various rations in meeting the vitamin A requirements of dairy animals, vitamin E deficiency in cows, a comparison of two levels of calcium and phosphorus intake on the health and milk production of cows, and the mineral intake of cows under a free-choice system of mineral supplementation.

[Dairy investigations by the New York State Station] (*New York State Sta. Rpt. 1941*, pp. 16, 18-19, 24-25).—Brief reports of findings not previously noted include improved methods for paraffining milk bottle caps and paperboard containers, bacterial control in surface-ripened cheeses, gas production and oxygen consumption in ripened Cheddar cheese, the identification of white particles appearing on aged cheese, and the development of tests for determining the efficiency of homogenization and the fat content of homogenized milk.

Higher milk production through improved management methods, G. Q. BATEMAN (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, pp. 6-7, figs. 3).—This is a general discussion on the feeding of dairy cattle for maximum production. Improved pastures and increased feeding of concentrates are stressed. It is the author's opinion that Utah dairy production can be increased 13 percent or more by improved feeding and management practices and by milking more cows.

Preservation of bovine spermatozoa in yolk-citrate diluent and field results from its use, G. W. SALISBURY, H. K. FULLER, and E. L. WILLETT. (Cornell Univ. et al.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 905-910).—A diluent composed of equal amounts of an M/15 solution of sodium citrate and fresh egg yolk was compared with the yolk-phosphate diluent of Phillips and Lardy (*E. S. R.*, 83, p. 615) for the preservation of bovine spermatozoa. These preparations appeared to be of equal value in preserving the motility of spermatozoa stored at 5° C. for from 2 to 4 days. When held for 6 days or more, however, motility was better preserved in the yolk-citrate preparation. In actual insemination tests with semen stored up to 5 days, the results secured with semen stored in the yolk-citrate diluent did not differ significantly from those where the yolk-phosphate diluent was used (*E. S. R.*, 84, p. 610.)

The bacteriology of bull semen, I. C. GUNSALES, G. W. SALISBURY, and E. L. WILLETT. (Cornell Univ.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 911-919).—The bacterial counts on 43 ejaculates obtained from 19 bulls by use of an artificial vagina ranged from 1,000 to 22,000,000 per cubic centimeter. Of the 12 bulls used in an artificial breeding association only 3 gave semen bacterial counts

of over 100,000 per cubic centimeter, and the average of the logarithms of these plate counts was 22,000 per cubic centimeter. In 28 samples collected from 7 bulls in the University herd (generally used for natural breeding), the average of the log of the plate counts was 225,000 per cubic centimeter, or approximately 10 times that of the association bulls. The predominating types of organisms in the various samples are indicated. Where bulls were subjected to muddy lots, douching the sheath and washing the underline markedly reduced the number of bacteria in the semen. When fresh eggs from healthy hens were used and aseptic methods employed in its preparation, an almost sterile yolk-phosphate diluent was consistently produced. Under other conditions the diluent was responsible for the addition of large numbers of bacteria to the semen samples. Little bacterial growth occurred in samples stored at 5° C. or lower.

Estimation of initial live weight at each lactation of dairy cows, W. L. GAINES, H. P. DAVIS, and R. F. MORGAN. (Ill. and Nebr. Expt. Stas.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 983-992, figs. 3).—Based on an analysis of over 5,500 live weight and chest girth measurements for Ayrshire, Guernsey, Holstein, and Jersey cows, taken at the Nebraska Station over a period of 19 yr., an equation has been derived for estimating the live weight during the first month of lactation (initial live weight) from the chest girth. The equation is $W=0.342(G+g)^{1.85}$, where W is initial live weight in pounds, G is actual chest girth in inches, and g is a girth modifier for age and breed of cow, being 0 for Jersey cows under 3 yr. of age and ranging up to 9 for Holstein cows 5 yr. of age or older. It is shown that in the application of a formula $W=aG^b$, the value of the exponent b varies widely with breed, age, and stage of lactation of the animal, ranging from a minus value to +2.93. By adopting the compromise value of 1.85 for b , as in the above formula, and applying a correction for breed and age, initial live weight estimates of reasonable accuracies may be obtained from chest girth measurements. A steel tape bearing on the face of the case a table of weights and modified girth is described.

The effect of vitamin A and certain members of the B-complex upon calf scours, P. H. PHILLIPS, N. S. LUNDQUIST, and P. D. BOYER. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 977-982).—The application of vitamin therapy in attempts to control calf scours in two dairy herds is reported.

In a Holstein herd experiencing marked troubles with calf scours, the administration of 10 cc. per week per calf of shark-liver oil (15,000 International Units of vitamin A per gram) gave temporary improvement in all cases, but only one-half of the calves recovered sufficiently to show no effect of the disease.

In a Jersey herd badly infected with this disorder, the administration of shark-liver oil as above, plus a mixture of vitamin B₁, riboflavin, pantothenic acid, choline, and nicotinic acid at the respective rates of 1, 1, 5, 5, and 10 mg. daily, completely controlled the calf scours. Supplementary trials gave evidence that nicotinic and pantothenic acids probably were the factors of the vitamin B complex particularly needed under the existing feeding plan. Blood analyses indicated that newborn calves generally are well fortified with ascorbic acid but very deficient in vitamin A. The ingestion of normal colostrum quickly resulted in normal blood plasma carotene levels. The vitamin A in the blood of newborn calves appeared to be only slightly influenced by the vitamin A intake of the dam. Low ascorbic acid values in the blood plasma were increased by the feeding of shark-liver oil.

Blindness in cattle due to papilledema, J. O. WETZEL and L. A. MOORE (*Amer. Jour. Ophthalm.*, 23 (1940), No. 5, pp. 499-513, figs. 9).—This report, present-

ing detailed case histories of six calves which developed blindness due to the constriction of the optic nerve and associated with papilledema, supplements earlier reports on the effect of vitamin A deficiency in the rations of calves (E. S. R., 85, p. 241).

Some ocular changes and deficiency manifestations in mature cows, fed a ration deficient in vitamin A, L. A. MOORE. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 893-902, pl. 1, figs. 2).—In further studies, six mature cows were maintained on a low-carotene basal diet for extended periods. When the plasma carotene values receded to a level of 0.2 to 0.5 $\mu\text{g.}$ per cubic centimeter, acute vitamin A deficiency symptoms soon followed in all cases. These included night blindness, incoordination, and an edema of the legs. None of the animals developed blindness due to a constriction of the optic nerve, such as commonly occurs in calves. A definite papilledema developed in four of the cases, and once this condition had begun a considerable time was required for it to recede after adequate feeding was resumed. An ocular change resulting from vitamin A deficiency, described in detail, was characterized by bleaching of the tapetum lucidum, followed by a mottled appearance of both the tapetum lucidum and the tapetum nigrum. It is noted that a Guernsey cow which succumbed to vitamin A deficiency had a very yellow fat at autopsy, evidently due to the presence of carotene, which suggests that animals are unable to draw extensively from this store of the pigment.

The production of high vitamin A milk by diet, H. J. DEUEL, JR., N. HALLDAY, L. F. HALLMAN, C. JOHNSTON, and A. J. MILLER (*Jour. Nutr.*, 22 (1941), No. 3, pp. 303-313).—Tests were conducted with milking Guernsey cows to determine the effect of fortifying rations with shark-liver oil on the vitamin A content of the butterfat. During a preliminary period of 4 weeks, when all animals received the basal ration, the level of vitamin A excreted in the milk averaged around 40 International Units per gram of butterfat. Six animals, which were retained on the basal ration, continued to show similar vitamin A values, weekly averages ranging from 31 to 55 I. U. per gram of butterfat. When the remaining animals received a daily supplement of 30 cc. of shark-liver oil (700,000 I. U. of vitamin A), the vitamin A potency of the butterfat promptly rose to over 60 I. U. per gram. After 11 weeks, three of the animals received 60 cc. of shark-liver oil daily and the vitamin A values in the butterfat further increased to over 100 I. U. per gram, reaching a maximum in one case of 172 I. U. No toxic symptoms resulting from the feeding of shark-liver oil were noted, and cows receiving the supplement maintained a somewhat higher rate of milk and butterfat production than the untreated controls.

The effect of vitamin A intake on vitamin A content of butter fat, H. J. DEUEL, JR., N. HALLDAY, L. HALLMAN, C. JOHNSTON, and A. J. MILLER (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 479-480).—A résumé of research described above.

The effect of shark-liver oil on the vitamin A content of milk and on milk production, H. J. DEUEL, JR., and J. P. NUTTALL (*Certified Milk*, 16 (1941), No. 186, pp. 3, 19-22, figs. 3).—Based on research noted above.

The ascorbic acid content of cow's milk during pregnancy, A. D. HOLMES, F. TRIPP, E. A. WOELFFER, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Jour. Nutr.*, 22 (1941), No. 3, pp. 267-271).—Continuing investigations on the ascorbic acid content (E. S. R., 84, p. 236), milk obtained from Guernsey and Holstein cows at various stages of lactation and gestation was analyzed for ascorbic acid. Milk from Guernsey cows contained the highest average amount of ascorbic acid during the first month of pregnancy (average 22.47 mg. per liter), followed

by a gradual and fairly consistent decline with advance of pregnancy. Milk from Holstein cows showed a somewhat different pattern. Ascorbic acid values declined from the first to the fourth month of pregnancy, but increased consistently during the fifth, sixth, and seventh months and then declined during the late stages of pregnancy. A maximum average value of 17.87 mg. per liter was reached during the sixth month. While a gradual downward trend in ascorbic acid values of milk with advance of pregnancy is indicated, different cows showed considerable variation at all stages of gestation.

Oxidized flavor in milk.—IX, The effect of the quality of hay and early stage of lactation on the carotene content of butterfat and on the ascorbic acid content of the milk and their relationship to the development of metal-induced oxidized flavor, W. C. BROWN, A. H. VANLANDINGHAM, and C. E. WEAKLEY, JR. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 925-935, figs. 8).—This series is continued (E. S. R., 85, p. 526). In an experiment with Jersey cows known to produce milk susceptible to copper-induced oxidized flavor development, all animals were subjected to a carotene depletion period of 4 weeks. During the ensuing 8-week period the feeding of brown alfalfa hay of low carotene content to one group resulted in a further decrease in the carotene content of the milk but did not increase the intensity of oxidized flavor. The feeding of high-quality, green alfalfa hay, together with alfalfa leaf meal, to the other group caused a significant increase in the carotene content of the milk and greatly retarded or eliminated the tendency for oxidized flavor to develop. These and supplementary data suggested, however, that the carotene of the milk may not be the substance responsible for this reduction in susceptibility to oxidized flavor, but that some other substance or substances associated with it in green hay or alfalfa leaf meal may be the important factor or factors.

A study of the relation of the stage of lactation to carotene and ascorbic acid contents of milk indicated that the carotene level was highest at the beginning of the milking period, followed by a gradual decline to a normal level in a few weeks, whereas the ascorbic acid level was usually low immediately after parturition, increasing gradually to a maximum level in 7 or 8 weeks. It is concluded that ascorbic acid in the milk plays a minor role in the susceptibility of the milk to metal-induced oxidized flavor.

Experiments on the use of certain antioxidants for control of oxidized flavor in dairy products, W. J. CORBETT and P. H. TRACY. (Univ. Ill.). (*Food Res.*, 6 (1941), No. 5, pp. 445-459).—A wide range of materials was tested with respect to their antioxidative properties when added to milk, ice cream, or butter. In tests with pasteurized, copper-contaminated whole milk, tyrosine or its ethyl or butyl esters proved to be effective antioxidants when added in concentrations of 0.02 to 0.04 percent, and rarely did any undesirable off-flavor result from their use. The normal amyl esters of both tyrosine and leucine were also effective antioxidants, but each imparted an objectionable off-flavor to the milk. The diethyl ester of glutamic acid exerted little antioxidative effect and imparted an objectionable flavor. Additions of ascorbic acid to milk gave variable results. In concentrations ranging from 10 to 100 mg. per liter, oxidized flavor was retarded but not inhibited in metal-free milk, while in copper-contaminated milk this off-flavor was retarded for a time but beyond a certain point its development was accelerated by the presence of ascorbic acid. In concentrations of 50 to 100 mg. per liter, oxidized flavor developed before all of the reduced ascorbic acid disappeared. The addition of a pancreatic extract at 1:25,000 effectively prevented oxidized flavor development. Concentrated water extracts of cereal grains were also strongly antioxidative, the most effective

product resulting from the drying of a mixture of water extract of cereal flour and concentrated skim milk on a roller drier. Substances which retarded oxidized flavor development generally had no effect on the oxidation of ascorbic acid. Paper milk bottles treated with oat flour were only slightly, if any, more effective than untreated paper bottles in retarding the development of oxidized flavor in milk. The addition of water extracts of cereal flours or a commercially prepared Avenized sugar had only a slight antioxygenic effect on ice cream. The dried cereal extract-concentrated skim milk mixture was more effective in this respect. The addition to churning cream of a concentrated water extract of the cereal flours or the addition of an Avenized salt to the butter tended to retard oxidized flavors in butter (E. S. R., 86, p. 240).

The effect of processing on the nitrogen distribution in milk, S. G. MENEFEE, O. R. OVERMAN, and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 953-968).—A semimicro method for determining total N in whole milk, as previously described (E. S. R., 84, p. 582), was applied in analyzing various protein fractions in milks processed in a number of ways. Data are presented on the total N, noncasein N, nonprotein N, globulin N, casein N, albumin N, and proteose N for the various samples. Pasteurization of milk at 145° F. for 30 min. and homogenization at normal and abnormal pressures produced no significant changes in N distribution. In addition to the coagulation of albumin and globulin in the evaporation of milk, there was evidence to indicate that some hydrolysis of the proteins occurs as a result of this processing. Condensing skim milk produced only slight changes in N distribution. The addition of steapsin, trypsin, and Enzylac to milk at 145° for 30 min. produced a definite hydrolysis of the milk proteins.

The effect of pasteurization on some constituents and properties of goat's milk, H. S. HALLER, C. J. BABCOCK, and N. R. ELLIS (*U. S. Dept. Agr., Tech. Bul. 800* (1941), pp. 14, figs. 2).—Mixed herd samples of goat's milk collected at intervals over two lactation periods were pasteurized in the laboratory at 142°, 145°, or 147° F. for 30 min. and at 160° for 15 sec. Either the holder method or the short-time, high-temperature method of pasteurization decreased the solubility of the calcium and phosphorus salts and denatured the soluble albumin and globulin only slightly, the change being less than the normal variation of these substances in the milk. Both methods improved the flavor of the milk slightly and greatly improved its keeping quality. The holder method decreased the curd tension and the reduced ascorbic acid content of the milk considerably, and the short-time, high-temperature method reduced the curd tension only slightly and did not affect the reduced ascorbic acid. The phosphatase was inactivated sufficiently for the milk to pass the phosphatase test for proper pasteurization when heated only 5 min. at 143°, so that this test (as now used for cow's milk) cannot be applied to detect improper pasteurization of goat's milk. The effect of pasteurization on the solubility of calcium and phosphorous, on the denaturation of proteins, and on the ascorbic acid content of goat's milk is comparable to the effect of pasteurization on the constituents in cow's milk as reported by other investigators.

Pseudomonas putrefaciens in dairy plant equipment, H. F. LONG and B. W. HAMMER. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 921-924).—Using a special medium as previously described (E. S. R., 85, p. 102), isolation tests were made on such materials as curd and wood from various points in dairy plant equipment by direct smears and after enrichment in litmus milk at 3° C. for varying periods. Five separate cases are described in which *P. putrefaciens* was found to be present in churns and in the insulation of a leaky vat. Other types of organisms were isolated from cracks and

joints in churns, suggesting that in defective and highly contaminated butter much of the contamination may originate in the churns.

A discussion of the new agar employed in making standard plate counts, M. A. FARRELL. (Pa. State Col.). (*Pa. Assoc. Dairy Sanit. Ann. Rpt.*, 16 (1940), pp. 90-92).—Based on the general trend of results obtained by several investigators in comparing the bacterial counts in milk obtained by plating on the old and on the new standard medium, the author is of the opinion that there is no need to revise the present standards for bacterial content of various grades of market milk in view of the adoption of the new medium.

A study in cheese ripening: The influence of autolyzed cells of *Streptococcus cremoris* and *Streptococcus lactis* on the development of *Lactobacillus casei*, P. A. HANSEN (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 969-976, figs. 3).—Three methods of preparing suspensions of killed cells were employed: (1) Autolysis of the bacteria by adding sodium chloride and toluene to a suspension of cells and holding at 49° C. for 5 weeks, (2) sonic vibration of a cell suspension for from 10 to 30 min., and (3) sterilization of a fresh suspension. The results of four separate experiments are described in which the effects of these various preparations on the growth and lactic acid production of different strains of bacteria were determined. The development of *L. casei* and *Betacoccus cremoris* (*S. citrovorus*) was stimulated by the extracts of *S. cremoris* or *S. lactis*, as evidenced by increase in the end point of fermentation and the final bacterial crop. *L. helveticus* was not significantly stimulated by the presence of these preparations, nor were *S. lactis* or *S. cremoris* significantly stimulated when grown in media enriched by their own cell content. Preparations of autolyzed cells or sonic vibrated cells were more potent than the non-treated control suspensions of killed cells. In all instances the active principle was filtrable through a Seitz filter EK. It is suggested that the stimulation of *L. casei* by *S. cremoris* and *S. lactis* may play an important role in the ripening of cheese, where these species are found at first, then die and disintegrate, and are followed by *L. casei*. The phenomenon may also be of importance in butter and cheese cultures. The possibilities of employing the sonic vibrator as a tool in the study of associated growth of micro-organisms are discussed.

"Phage" in cheesemaking, C. K. JOHNS (*Canad. Dairy and Ice Cream Jour.*, 20 (1941), No. 2, pp. 18-19, 25, figs. 3).—This article supplements an earlier report on this study (E. S. R., 85, p. 396) and offers practical suggestions for meeting the problem under factory conditions.

Corn sirup solids improve frozen dairy products, L. R. GLAZIER and M. J. MACK. (Mass. Expt. Sta.). (*Food Indus.*, 13 (1941), No. 6, pp. 68-70, 114-115, figs. 2).—Consumer preference studies supplemented by certain physical tests were employed to determine the desirability of replacing a part of the sucrose in ice creams, ices, and sherbets by corn sweeteners. Four series of comparable ice creams containing (1) 15 percent sucrose, (2) 11 percent sucrose plus 4 percent dextrose, (3) 11 percent sucrose plus 4 percent enzyme-converted corn sirup, and (4) 11 percent sucrose plus 4 percent corn sirup solids, were preferred with almost equal frequency when judged by over 200 consumers. Ice creams containing only sucrose were adjudged sweetest by 27.7 percent of the judges as compared with 25.6, 21.7, and 25.0 percent for series 2, 3, and 4, respectively. Lot 4 containing corn sirup solids was most preferred on the basis of body and texture, followed in order by lots 2, 1, and 3. The corn sirup solids raised the freezing point of ice cream slightly, increased mix viscosity, decreased the rate of melting, and had little effect on the whipping ability of the product. Replacing 25 percent of the sucrose in ices and sherbets with

corn sirup solids improved the whippability of the mixes and gave smoother products which were highly preferred by consumers. Surface crustation was also reduced by this practice.

The temperature method for control of whipping in ice cream, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Rev.*, 25 (1941), No. 3, pp. 34, 74, 76, fig. 1).—A more complete account (E. S. R., 85, p. 520) of a discussion pointing out the practical application of the established relationship between temperature and overrun in ice cream mixes frozen in the batch freezer (E. S. R., 77, p. 847).

Selection and use of color in ice cream, C. A. IVERSON. (Iowa State Col.). (*Ice Cream Rev.*, 24 (1941), No. 11, pp. 36, 38, 40, 44-45).—This general discussion points out the importance of purchasing ice cream color in a form best suited to the volume used, and emphasizes the importance of avoiding bacterial contamination in ice cream through the use of unsanitary coloring material.

Sandiness in ice cream—its causes and control, H. H. SOMMER. (Univ. Wis.). (*Ice Cream Rev.*, 24 (1941), No. 11, pp. 109-111).—In this general discussion of the problem the author points out the importance of maintaining a proper ratio of water to serum solids in the ice cream mix in order to prevent the development of sandiness in ice cream. The formula $\frac{100-x}{6.9}$ = percent serum solids (upper limit), in which x equals all solids other than serum solids in the mix, is proposed as a convenient basis for determining a safe level of serum solids to be incorporated in the mix.

VETERINARY MEDICINE

Index-catalogue of medical and veterinary zoology.—Part 5, Authors: E to Flynney, A. HASSALL, M. A. DOSS, R. M. TAYLOR, G. B. CARSON, and D. B. SEGAL (U. S. Dept. Agr., 1941, pp. [1]+1177-1458).—A continuation of this index catalog (E. S. R., 84, p. 523).

An inexpensive bacteriological incubator, C. S. BRYAN and L. F. JENNINGS. (Mich. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 11, pp. 567-568, figs. 3).—Plans are given for the construction of an efficient, inexpensive bacteriological incubator devised at the station. The thermostatic control permits the regulation of temperature within the incubator from any point slightly above room temperature to one more than 37° C. An inside temperature of 37°±2° can be maintained under room temperature conditions varying from 1° to 39°. This incubator is particularly well adapted to the incubation of milk samples for the microscopic test for streptococcal mastitis, but it can also be used for other purposes.

Parasitos de los animales domesticos [Parasites of the domestic animals], DON CARLOS CHAVARRIA A. ([Costa Rica] Dept. Nac. Agr., Bol. Téc. 39 (1941), pp. [1]+47, figs. 27).

A descriptive study of a spore-forming bacillus isolated from actinobacillotic-like lesions, L. B. SCHWEIGER, D. TRAINER, and D. F. EVELETH. (Ark. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 2, pp. 285-286).—A spore-forming bacillus was isolated from actinobacillotic-like lesions, five separate isolations having been made from cattle and two from sheep. All cultures were subjected to complete morphological, cultural, physiological, and pathogenicity comparisons. The pathogenicity studies were carried out on calves, rabbits, guinea pigs, rats, chickens, and pigeons. Similar clinical lesions were produced in calves, guinea pigs, and rats. From the characteristics exhibited in the study, the organism is classified as belonging to the *Bacillus subtilis* group of the family Bacillaceae.

Laboratory infections due to *Brucella*, K. F. MEYER and B. EDDIE. (Univ. Calif.). (*Jour. Infect. Diseases*, 68 (1941), No. 1, pp. 24-32).

A cytophagic reaction employed in the diagnosis of *Brucella* infection, M. JERSILD (*Jour. Infect. Diseases*, 68 (1941), No. 1, pp. 16-19).—Description is given of a cytophagic test in brucellosis in which inactivated serum, bacterial suspension, and citrated blood without opsonins are used. This test shows that serum from cases of undulant fever contains immune opsonins at an early phase of the disease. "The reaction is more sensitive than agglutination and complement fixation. It has certain advantages over the cytophagic reaction of Huddleson [E. S. R., 70, p. 527], as the blood does not need to be examined soon after collection; besides it reveals an inhibition of the phagocytosis which occurs when there is an especially high opsonin content in the blood. After a skin test (with Huddleson's brucellergen) there occur immune opsonins, most markedly if there is already a small amount of antibody in the blood. If the skin test is positive there occurs an abundance of antibodies (agglutinins, complement-fixing bodies, and immune opsonins), an expression of the fact that a previously infected organism can quickly mobilize its antibodies."

The isolation of *Brucella* from milk, R. BRADLEY, M. WOLF, F. ACTON, and C. A. HUNTER (*Jour. Bact.*, 42 (1941), No. 2, p. 286).—In the course of routine examinations, whey agglutination tests for *Brucella* were run on 1,788 samples of milk. Of these 262 were positive, and by plate isolations *B. abortus* was isolated and identified from 20 of these. In one herd of 56 cows 21 of 224 quarter samples gave positive whey agglutinations, and of this number *B. abortus* was isolated from 11. These isolations represented 5 cows with positive whey agglutinations from 7 animals. About 9 percent of this herd were discharging *Brucella* organisms into the milk.

The rôle of one species of cockroach and several species of flies in the dissemination of *Brucella*, H. H. RUHLAND and I. F. HUDDLESON. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 371-372).—It is concluded from the two experiments here reported that *B. abortus* does not remain alive in the intestinal tract of the American cockroach for more than 24 hr. Only a few colonies were obtained on the culture medium from those that were positive. No evidence was obtained that this insect is an important conveyor of *Brucella*. In cultures made of houseflies, blowflies, and stableflies the amount of growth obtained was heavier and freer from contamination 48 hr. after exposure than at earlier periods. In view of the fact that well-known species of flies can excrete the organism with intestinal droplets for 4 days and possibly longer periods, they must be considered as one of the possible means of transmitting brucellosis from animal to animal and from animal to man.

The relation of *Brucella abortus* infection to the vitamin A content of fetal livers, G. H. HART and H. R. GUILBERT. (Univ. Calif. coop. U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 390-393, 394).—Hypotheses regarding possible interplay between the action of vitamin A deficiency and *Brucella* infection, presented by the authors, are: "(1) Involvement of the fetal membranes by *Brucella* organisms may restrict the transfer of vitamin A to the fetus and membranes and thereby decrease vitality or cause death. (2) Vitamin A deficiency with its coincidental alteration in placental cells, vulnerable to deficiency because they are developing rapidly, could hasten the invasion and effect of the *Brucella* infection, which exhibits tropism for these tissues. (3) The resistance to infection produced in cattle by *B. abortus* strain 19 vaccine is a relative immunity which can be overcome by sufficiently severe natural infection. It is possible that either a degree of vitamin A deficiency or exposure to natural *Brucella* infection, which could not cause abortion when acting alone, might

effect actual expulsion of the fetus in vaccinated animals when acting together." Critical experiments to prove or disprove these possibilities have not been carried out.

Studies on the relationship of brucellosis to periodic ophthalmia, E. L. STUBBS and W. G. LOVE (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 777, pp. 476-480, 481).—Report is made of 40 cases of periodic ophthalmia examined that were given agglutination tests for brucellosis. Six cases gave a slight agglutination in low dilutions which would be classed as suspicious on the basis of the test as used in cattle. The others were entirely negative. The case reports are followed by a tabulated summary. These findings fail to indicate any relationship between brucellosis and periodic ophthalmia.

Chronic, atrophic type of brucellosal arthritis, E. GOLDFAIN (*Jour. Lab. and Clin. Med.*, 27 (1941), No. 2, pp. 168-172, figs. 3).

Virus diseases, with special reference to encephalomyelitis, C. A. MITCHELL (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 10, pp. 273-277).

Studies in equine encephalomyelitis: Susceptibility of some mammals and birds, C. A. MITCHELL and R. V. L. WALKER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 11, pp. 314-319, figs. 2).—The results of inoculations for the artificial infection of a number of mammals and birds in order to determine their susceptibility to the equine encephalomyelitis virus are summarized in tables. Using the western type of the virus, the mammals found quite susceptible were the horse, guinea pig, mouse, white rat, hamster, and chipmunk. Cattle were only slightly susceptible. Swine, sheep, goats, foxes, cats, ferrets, and rabbits were refractory. Groundhogs were susceptible when young. All young birds inoculated with the virus were very susceptible; older birds were resistant. The border line between the two was well defined. For example, chickens were very susceptible until 2 weeks of age, when they quickly became resistant. The virus was found only in the brains of mammals but in both brains and blood of birds which died from the infection. However, in general, the mammals were inoculated intracranially, the birds subcutaneously. No animal or bird studied became host to the virus with the possible exception of the goose.

Isolation of western equine encephalomyelitis virus from a naturally infected prairie chicken, H. R. COX, W. L. JELLISON, and L. E. HUGHES (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 39, pp. 1905-1906).—Record is made of the isolation of the western equine encephalomyelitis virus from both the brain and the spleen of a prairie chicken (*Tympanuchus cupido americanus*), known also as the pinnated grouse or prairie hen, that was shot south of Rugby, N. Dak., in August 1941, while human epidemic cases were occurring in the vicinity.

Studies on equine encephalomyelitis.—I, Antigenic properties of pigeon-brain-tissue vaccine, R. GRAHAM and N. D. LEVINE (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 430-435).—In the work reported, the details of which are given in six tables, equine encephalomyelitis pigeon brain virus of the western strain was passaged through 10 consecutive pigeon transfers by intracranial inoculation of 0.1 cc. of a dilution of 1:1,000,000. A titration of the pigeon-brain-tissue virus intracranially revealed approximately 5 billion pigeon lethal doses and 100 million guinea pig lethal doses of virus per gram. Three separate lots of pigeon-brain-tissue virus inactivated by the addition of 0.5 percent formalin showed a measurable degree of immunizing power in guinea pigs and also in pigeons following subcutaneous administration.

Equine encephalomyelitis, A. H. BRUECKNER (*Ind. Acad. Sci. Proc.*, 49 (1939), pp. 54-61).

The incidence of glomerulonephritis in domesticated animals, R. F. LANGHAM and E. T. HALLMAN. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 777, pp. 471-475, figs. 12).—Report is made of a study of 236 cases of nephritis in domesticated animals, among which only 7 were classified as glomerulonephritis. While the pathology of these cases was not identical with that described for man, the extent and distribution of glomerular lesions appeared to justify this classification. The primary lesions involved the renal corpuscles and were characterized by thickening of the basement membranes, increased amounts of connective tissue, and hyalinization. The tubules showed secondary changes characterized by cloudy swelling, fatty degeneration, hydropic degeneration, atrophy, and gradual replacement as the result of the intensive productive tissue changes.

Biological and immunological studies of *Listerella*, L. A. JULIANELLE (*Jour. Bact.*, 42 (1941), No. 3, pp. 367-383).—The conjunctivitis and keratitis induced by *Listeria* is considered the most characteristic symptom produced by the organism and constitutes a unique reaction in infectivity. Serologically the genus appears to be composed of at least two specific types, and it is possible the types are associated with ultimate animal origin. Antiserums of high agglutinating titers offer little or no protection in infection in mice. *Listeria* does not stimulate "heterophile" antibody during active infection or prolonged immunization. A list is given of 18 references to the literature.

The identification of *Erysipelothrix* and its relation to *Listerella*, L. A. JULIANELLE (*Jour. Bact.*, 42 (1941), No. 3, pp. 385-394).—In a study made of 13 different strains of *Erysipelothrix* all were found to ferment glucose, lactose, and *d*-levulose without production of gas; about one-half the strains form acid in galactose. "A number of other 'sugars' tested are not altered by any of the strains. *Erysipelothrix* is virulent for mice and rabbits, inducing fatal infection. During experimental infection, leucocytosis and mononucleosis are irregular and therefore unreliable as measures of infection. With death, the animals may or may not show focal necrosis of the liver. When this form of hepatitis is present the foci are smaller and less frequent than in experimental listerellosis. None of the strains when inoculated conjunctivally by instillation or swabbing induce the corneal responses seen in similar infection by [*Listeria*]. Following such inoculation, however, *Erysipelothrix* irregularly penetrates the conjunctiva and establishes a fatal bacteremia. Measured by the agglutination reaction, *Erysipelothrix* appears to be a single group antigenically which differs from the two immunological types of [*Listeria*]."

The role of phagocytosis in natural and acquired immunity in avian malaria, W. D. GINGRICH (*Jour. Infect. Diseases*, 68 (1941), No. 1, pp. 37-45, figs. 6).

Ornithodoros turicata and relapsing fever spirochetes in New Mexico, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 47, pp. 2258-2261, fig. 1).—Forty-one lots with a total of 604 *O. turicata* ticks were collected during a rapid tick survey made in 10 counties in southern and southeastern New Mexico. Of 40 lots tested, 8, representing 4 counties, namely, Roosevelt, Chaves, Lea, and Hidalgo, were found to harbor relapsing fever spirochetes.

The influence of host and intermediate reservoir host in determining the epidemiologic pattern of bovine pseudorabies and swine influenza, R. E. SHOPE (In *Problems and Trends in Virus Research*. Philadelphia: Univ. Pa. Press., 1941, pp. 55-66, fig. 1).

Nitrate poisoning of livestock, W. B. DAVIDSON, J. L. DOUGHTY, and J. L. BOLTON (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 11, pp. 303-313).

Sulfo-Merthiolate as a germicide, H. M. POWELL and W. A. JAMIESON (*Ind. Acad. Sci. Proc.*, 49 (1939), pp. 45-53).

Arteriosclerosis in cattle associated with pulmonary ossification, G. T. CREECH. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 400-406, figs. 11).—This contribution deals with arteriosclerosis as it occurs in cattle, including a general picture of the gross lesions and histopathology as seen in cases observed over a period of years, and reports a case of unusual interest that was received at the laboratory. The observations made of cases of vascular lesions in cattle encountered in the Federal meat inspection service over a considerable period of years are said to indicate definitely that arteriosclerosis is not of common occurrence in the bovine species in the United States.

The effect of parturition on the blood picture of cows in health and during infection with *Brucella abortus*, L. C. FERGUSON, M. R. IRWIN, and B. A. BEACH. (Univ. Wis. coop. U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 394-399, figs. 2).—Records of the daily averages of the various cellular constituents of bovine blood during a 34-day period preceding and a 34-day period following parturition are presented in graphs. It appears that infection with *B. abortus* does not greatly influence the blood count during the parturient period, since the general trends, apparent in both "normal" and "infected" cattle, were similar. "The number of erythrocytes per cubic millimeter increased slightly immediately following calving and then decreased somewhat below the precalving level in the last 24 days of the postcalving period. The total number of leucocytes decreased significantly immediately following parturition and later increased to about the precalving level. There were no significant changes in the percentages of either the neutrophiles or the lymphocytes in the period studied. The percentage of monocytes increased considerably in the 10-day period following calving but returned to the normal or precalving figure in the following period. The percentage of eosinophiles seemed to vary inversely with that of the monocytes, since in the 10-day period following parturition the proportion was significantly decreased, after which there was a return to about the precalving level. The fluctuations which normally occur in the number of leucocytes and in the proportions of the different types are greater in the parturient period than at other times. Therefore, results from a single blood count made on a cow during this period of physiologic disturbance should not be confused with a pathologic response."

Studies on cowpox.—I, An outbreak of natural cowpox and its relation to vaccinia, H. R. HESTER, L. E. BOLEY, and R. GRAHAM. (Univ. Ill.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 360-378, figs. 7).—Report is made of an outbreak of natural cowpox or a disease clinically indistinguishable from it which occurred in a purebred herd of some 300 dairy animals.

Experimental studies of ephemeral fever in Australian cattle, I. M. and M. J. MACKERRAS and F. M. BURNET (*Austral. Council Sci. and Indus. Res. Bul.* 136 (1940), pp. 116, pls. 2, figs. 10).—The results of the survey reported are summarized in the general statement "that ephemeral fever is closely related to human dengue, that it is almost certainly insect-borne, that transmission is most probably cyclical, that the vector is probably a sandfly, and that the disease is likely to remain permanently as a recognizable clinical entity in Australia. It will be observed that we have made no mention of the way in which it may have entered Australia, but to the solution of that problem we have nothing to add."

An irritant for udder tissues produced by mastitis streptococci in milk, W. D. POUNDEN and C. E. ZEHNER. (Univ. Wis. coop. U. S. D. A.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 382-388).—In the work reported, injections of whey, resulting from the action of mastitis streptococci on milk, were made into milking and "dry" bovine udders. The results show that the products resulting from the in vitro action of mastitis streptococci on milk incubated at body temperature

produce a syndrome when injected into the mammary gland of the cow which is similar to if not identical with acute streptococcic mastitis.

Deferred milking—a method of handling acute streptococcal mastitis cases, W. D. POUNDEN. (Univ. Wis. coop. U. S. D. A.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 339-344).—Report is made of the treatment of an attack of acute catarrhal and 16 acute parenchymatous streptococcic mastitis cases by deferring milking. In a case of acute parenchymatous streptococcic mastitis temporary relief was obtained when a cow was milked at least six times per day and sulfanilamide administered. Another severe attack in the same quarter and similar attacks in two quarters on another cow were successfully handled by discontinuing milking of the affected quarters until the acute inflammatory reaction subsided and they returned to their original soft pliable texture. Ten cases were treated for mild attacks in a similar manner. Two severe attacks that occurred when a milking was omitted for the purpose of drying off the animals were similarly handled. Satisfactory results were obtained and both udders functioned normally when the cows freshened again. The time required for resolution of the inflammation in these 14 cases never exceeded 3 days. Delay in starting treatment was the probable cause of failure in one instance and premature resumption of milking in another. A case of acute catarrhal mastitis involving two quarters was treated by this method unsuccessfully.

Iodized mineral oil as a treatment for bovine mastitis, D. A. SANDERS. (Fla. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 407-410, fig. 1).—Observations made on a limited number of animals indicate that iodized mineral oil has valuable therapeutic properties as a treatment for chronic bacterial infections of the bovine udder.

The application of sodium azide to microscopic tests for bovine streptococcic mastitis, C. S. BRYAN. (Mich. State Col.). (*Jour. Bact.*, 42 (1941), No. 2, p. 293).—The test considered consisted of a microscopic examination of properly collected milk samples incubated at 37° C. for at least 12 hr. The use of a selective preservative yielding a final dilution of 1:15,000 of sodium azide, 1:5,000 of bromocresol purple, and 1:1,000 of glucose in the milk increased the accuracy of the results of the test as compared to the use of no preservative or brilliant green 1:50,000, and greatly reduced the time required to read the results by suppressing both the udder micrococci and contaminating bacteria.

Observations on the longevity of the liver fluke *Fasciola gigantica* in cattle, J. E. ALICATA and L. E. SWANSON. (Hawaii Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 417-418).—Experiments conducted have shown that in an infection with *F. gigantica* most of the flukes are eliminated by the end of 1 yr., but some of them may survive for at least 3 yr. and 4 mo. Details of an experimental infection of five steers with *F. gigantica* are presented in table form.

Calf vaccination—United States experimental project (New York State), A. WINTER (*Cornell Vet.*, 31 (1941), No. 4, pp. 355-360).—A progress report of work in which 1,172 calves chosen from 25 herds were vaccinated and maintained in the parent herds without any segregation from the older infected unit at any time. Approximately 80 percent of the calves vaccinated are said to have given negative blood reactions within a 12-mo. period.

Calfhood vaccination, M. WELSH (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 262-266).

Suggestive evidence of trace element deficiency in Illinois sheep, W. L. WRIGHT. (Univ. Ill.). (*Vet. Med.*, 36 (1941), No. 11, pp. 572-573, fig. 1).—A condition in lambs in an Illinois flock characterized by emaciation, anemia, and weakness, and in which improvement followed the feeding of a mineral mixture

containing iron, copper, magnesium, manganese, and cobalt, is described. A trace mineral deficiency in some Illinois soils is suggested.

A phenothiazine experiment statistically treated, B. G. PETERS, J. W. G. LEIPER, and P. A. CLAPHAM (*Jour. Helminthol.*, 19 (1941), No. 1-2, pp. 9-24).—Powdered phenothiazine administered to lambs as a drench in doses of 0.3 gm. per kilogram of body weight had no very marked effect on the worm burden as measured by egg counts and no effect in 3 weeks on worm counts and the weights of treated lambs.

A controlled experiment with phenothiazine in sheep, J. W. G. LEIPER, B. G. PETERS, and P. A. CLAPHAM (*Jour. Helminthol.*, 19 (1941), No. 1-2, pp. 25-34).—As judged by worm counts on 6 lambs, phenothiazine at the rate of 1 gm. per kilogram of body weight was without effect, whether given as compressed tablets or as a drench. As judged by egg counts per lamb on 12 lambs, before and after treatment, phenothiazine at the above rate significantly reduced the egg output of the worms. As judged by lamb weights, before and after treatment, powdered phenothiazine at the above rate was without effect during the brief course of the experiment. The tablets, on the other hand, led to a significant set-back in weight as compared with powder. In comparison with a drench made up with powder, the 5-gm. tablets were much easier to administer, but they had a significantly inferior effect on egg counts and lamb weights and at least in one case a tablet failed to disintegrate in 5 weeks.

A note on the failure of phenothiazine as an anthelmintic against *Strongyloides papillosus* of sheep, G. P. KAUZAL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 3, pp. 218-219).—The administration of 0.6 gm. of phenothiazine per kilogram of body weight to 4- to 5-month-old lambs had no effect on *S. papillosus*, and egg production of the females was unaffected. It prevents further development of the eggs passed during the 2 days following treatment, but thereafter the normal rate of development of larvae gradually recurs.

Treatment of ovine taeniasis with lead arsenate, E. C. McCULLOCH and J. E. McCoy. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 777, pp. 496-497).—Experiments with three yearling lambs affected with parasitism by tapeworms indicate that the administration of 0.5 gm. of lead arsenate per lamb is a reasonably safe and effective taeniafuge against *Moniezia* sp. Phenothiazine in doses of 24 gm. to seven such lambs had no effect on tapeworms of this genus.

Blood-concentration studies on sulfanilylguanidine in swine and sheep, H. S. CAMERON and W. A. McOMIE. (Univ. Calif.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 321-330).—The findings in a study on the blood and fecal concentrations and the toxicity of sulfanilylguanidine administered orally in varying doses to swine and sheep are reported. Swine were found to have a greater tolerance for the drug than lambs. Repeated treatments of 1 gm. per 20 lb. of body weight given twice daily for 5 days do not injure swine but are toxic for lambs. Dosage of 10 gm. per 20 lb. twice daily for 5 days was toxic for swine. Massive single doses as high as 1 gm. per pound of body weight produced no symptoms of toxicity. The absorption rate is considerably lower than that of sulfanilamide, but a greater amount relatively is conjugated. Dosage and blood concentrations on eight clinical cases of swine enteritis are given.

Lancefield group E streptococci in cervical abscesses of swine, H. J. STAFSETH and I. CLINTON. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 777, pp. 468-470).—Lancefield group E streptococci, heretofore isolated only from certified milk, were isolated by the authors from cervical abscesses of a 7-month-old pig.

Shigella equirulis infection in a sow, P. R. EDWARDS and E. L. TAYLOR. (Ky. Expt. Sta.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 392-393).—Report is made of

the case of a *S. equirulis*-infected sow that succumbed to septicemia. It is pointed out that this sow came from a farm used primarily for the production of standard-bred horses.

Connective tissue tumors of horses and mules, R. A. RUNNELLS and E. A. BENBROOK. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 427-429, 430, fig. 1).—A study made of 156 tumors that originated from various types of connective tissue in horses and mules in Iowa is reported. Benign neoplasms were encountered 65 times and malignant ones 91 times. In no particular age group was the incidence of benign connective tissue tumors significantly higher than in other age groups. More than one-half of the sarcomas occurred in horses between 1 and 4 yr. of age, inclusive. Fibromas constituted more than 50 percent of the benign tumors. Fibrosarcomas led the incidence rate among the malignant tumors with a percentage of 89. Fibromas often had their origin at sites of previous injury. The head and nasal passages were the seats of most common occurrence for more than one-half of the benign tumors. Among the sarcomas 39 percent were removed from the head and nasal passages, 30 percent from the limbs, and the remaining 31 percent from scattered regions of the surface of the body.

Soil properties in relation to the occurrence of grass sickness in horses, A. B. STEWART (*Jour. Agr. Sci. [England]*, 31 (1941), No. 3, pp. 308-319).

The preservation of horsesickness vaccine with "Merthiolate," J. H. MASON and R. A. ALEXANDER (*Jour. So. African Vet. Med. Assoc.*, 12 (1941), No. 1, pp. 1-11).—Report is made of nine experiments which have shown that the use of Merthiolate (sodium ethyl mercuri thiosalicylate) as a preservative in concentrations of from 1:10,000 to 1:20,000 has no appreciable adverse effect on horsesickness virus during a period of 3 mo. at 5° C. and of 43 days at between 17° and 23°. In these concentrations it is a much better bactericidal and bacteriostatic agent than ether. A concentration of 1:20,000 would appear to be sufficient to destroy the chance contaminant that might gain access to horsesickness vaccine. In a strength of 1:20,000 it is an excellent preservative for neurotropic horsesickness vaccine and is said to be used as a routine.

Experimental studies on the curative treatment of surra in native horses in the Philippines, III, with a report on the results obtained in British North Borneo, L. M. YURUC (*Philippine Jour. Sci.*, 75 (1941), No. 2, pp. 105-129).—In continuing these studies (E. S. R., 77, p. 702), naganol-atoxyl therapy was found valueless in the treatment of equine surra. When naganol was combined with sodium antimony tartrate and administered in nonlethal but slightly toxic doses, 2 out of 5 artificially infected surra horses and 1 out of 3 naturally infected animals recovered from the disease. Furthermore, from the field trial carried out in British North Borneo during the summer of 1938, of the 100 horses naturally infected and actually given the naganol-sodium antimony tartrate combination, 63 were cured of surra.

A resumé of studies and observations on infectious anemia, or swamp fever of horses, carried on by the Bureau of Animal Industry from 1935 to 1940, C. D. STEIN, O. L. OSTEN, and L. O. MOTT (*U. S. Dept. Agr., Bur. Anim. Indus.*, 1941, pp. 9).—A summary is given of the work of the U. S. D. A. Bureau of Animal Industry with infectious anemia commenced in 1935, contributions relating to which have been noted (E. S. R., 81, pp. 111, 717; 82, p. 391; 85, pp. 670, 825; 86, p. 94).

Hemorrhagic anemia studies in dogs, J. M. MCKIBBIN, A. E. SCHAEFER, and E. B. HART. (Univ. Wis.). (*Jour. Biol. Chem.*, 140 (1941), No. 1, pp. LXXXVII-LXXXVIII).—It was found that phlebotomized dogs when fed a whole milk ration usually show an immediate remission from their anemia when given adequate iron and copper, but when these minerals are supplemented with cobalt

at a level of 2 mg. per kilogram of body weight per day the dogs fail to respond. The resulting anemia is microcytic and resembles that arising from vitamin B₆ deficiency. When this ration is supplemented with 50 gm. of whole dry liver or 25 gm. of liver extract powder, the inhibition due to cobalt is overcome and remission from the anemia occurs. This is characterized by a striking increase in the red cell count, hemoglobin, hematocrit, and plasma iron levels of the blood. Saturation indices and mean corpuscular volume remain essentially the same as in the anemic condition. The ash fraction of liver extract was found to be inactive in overcoming the anemia as was a mixture of thiamin, riboflavin, nicotinic acid, pyridoxine, pantothenic acid, and choline at those levels in which these factors occur in the curative dose of liver extract. Ascorbic acid was also found inactive by both oral and intravenous routes. Some dogs receiving mineralized milk without cobalt fail to recover from their anemia after prolonged hemorrhage. The blood picture is very similar to that of the dogs receiving cobalt, and these dogs also respond to liver extract.

Tularemia in dogs, L. F. EY and R. E. DANIELS (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 24, pp. 2071-2072).—In this report (E. S. R., 86, p. 252) evidence is presented to show that dogs may naturally acquire mild tularemia by the ingestion of infected rabbit material. Dogs so infected will develop *Pasteurella tularensis* agglutinins in high titer in less than 20 days. It is suggested that blood specimens from dogs manifesting potential *P. tularensis* infection be subjected to routine agglutination tests. Report is made of a case in which a man and his three dogs acquired the infection from the same rabbit, the man succumbing in 7 days while the dogs survived.

Feeding rough fish to fur animals, R. G. GREEN (*Conserv. Volunteer*, 3 (1941), No. 15, pp. 14-18).—A summary is given of the present knowledge of Chastek paralysis, a highly fatal disease due to a vitamin B₁ deficiency that occurs among foxes and minks on fur farms, particularly in Minnesota (E. S. R., 85, p. 672). This deficiency is caused through the destruction of vitamin B₁ by an unknown factor in ground raw carp when the whole fish forms 20 percent of the diet. Through controlled experimental work with 50 foxes it was determined that 1 lb. of such carp will destroy about 5,000 units of Vitamin B₁, or more than a fox requires in an entire month. In feeding experiments it was determined that the edible fillets, which consist of white muscle meat, do not contain the vitamin B₁-destroying factor. The manner in which the fish is fed is important. If fish forms the basic ration it must be fed alternately with a ration that does not contain fresh fish. Cooking the fish every third day to destroy the vitamin B₁ inactivating factor will prevent the disease.

Subacute arthritis and septicemia of streptococcal origin in silver foxes, R. G. BENEDICT, W. WISNICKY and E. McCOY. (Univ. Wis.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 777, pp. 498-499, 500).—In a study of three cases of streptococcal arthritis and two of septicemia occurring in silver foxes, "animal pyogenes" (Lancefield group C) were found, through physiologic and serologic tests, to be the etiologic agent. Infective horse meat which formed a part of the ration was the most probable source of the organisms. Attempts to produce arthritis or septicemia in red fox pups by direct feeding of a pure culture isolated from one of the fatal cases of arthritis were unsuccessful.

Some lungworm records from foxes in New York, F. C. GOBLE and A. H. COOK (*Jour. Mammal.*, 22 (1941), No. 4, p. 456).—The finding of *Eucoleus aerophilus* in the trachea and larger bronchi of 22 red foxes and *Crenosoma vulpis* in the bronchi of 6 red foxes and 2 gray foxes that had been trapped in the

Helderberg Plateau region of southwestern Albany and northwestern Greene Counties, N. Y., is recorded.

The toxicity of *Indigofera endecaphylla* Jacq. for rabbits, M. W. EMMEL and G. E. RITCHIEY. (Fla. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 675-677).—Several rabbits that grazed on plats of the leguminous forage plant *I. endecaphylla*, first introduced into Florida from Ceylon in 1925, succumbed to its intoxication in from 6 to 17 days. The symptoms and post-mortem findings are reported upon. No tests were made of its effect upon cattle, sheep, and mules, and no evidence was found that it is toxic to these animals.

Poultry production may be increased through control of disease, D. E. MADSEN (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 4, pp. 3, 10, figs. 4).—The part of disease control efforts in securing increased production of poultry products to meet the requirements of the National Agricultural Defense program is considered. The present practice of force feeding for year around production causes a drain on the reproductive system which may make the bird less resistant to infectious disease or cause a general organic break-down. Records kept by egg-laying contests operated in various States reveal an increase from the average mortality in 1913 of 6.3 percent to 30 percent in 1936. The application of control measures is dealt with as relate to stock resistant to pullorum disease, coccidiosis, infectious colds or "coryza," lymphomatosis, and the use of vaccine for fowl pox and laryngotracheitis.

The vitamin A reserve of diseased fowls, V. B. HOLLAND, G. H. SATTERFIELD, H. C. GAUGER, A. D. HOLMES, and F. TRIPP. (Univ. N. C. et al.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 543-550).—In the study reported 85 fowls of various breeds, ages, and sexes which had been maintained under a wide variety of feeding and management conditions and were afflicted with various avian diseases and internal parasites were autopsied and the vitamin A and carotene content of their livers determined. These birds came from a wide variety of sources and had been maintained under extremely different management and feeding conditions. The affections represented included pullorum disease, fowl typhoid, coryza, botulism, coccidiosis, leucosis (neural), leucosis (visceral), fowl pox, epidemic tremor, avitaminosis A, tumors (unclassified), poisoning, internal parasites, crop-boundedness, salpingitis, and gizzard injury. The results have shown that the vitamin A reserve and carotene stored in the livers of birds afflicted with specific avian diseases vary over an extremely wide range. Therefore, with the exception of avitaminosis A, it is not possible to correlate a specific avian disease or internal parasite infestation with the vitamin A and carotene stores found in the liver of the domestic fowl.

Avian thiamin deficiency: A correlation of the pathology and clinical behavior, R. L. SWANK (*Jour. Expt. Med.*, 71 (1940), No. 5, pp. 683-702, pls. 4, fig. 1).

Avian thiamine deficiency.—III, Characteristic symptoms and their pathogenesis, R. L. SWANK and O. A. BESSEY (*Jour. Nutr.*, 22 (1941), No. 1, pp. 77-89, fig. 1).

Aspergillus fumigatus infection in adult chickens, H. C. GAUGER. (N. C. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 445-446).—Report is made of findings in a flock of 2,300 8-month-old Barred Plymouth Rock pullets that had access to spoiled mash and grain and showed symptoms of a respiratory affection. *A. fumigatus* was found to be the cause of respiratory and kidney lesions in these birds, the symptoms of which were not unlike those present in laryngotracheitis. Abnormal mortality did not occur, but egg production was temporarily lowered. Attempts at transmission gave negative results.

Immunization against cecal coccidiosis in chickens by the use of X-ray-attenuated oöcysts, S. H. WAXLER. (Univ. Wis.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 777, pp. 481-485).—In the study of cecal coccidiosis reported there was found to be a progressive decrease in the hemoglobin content of the blood with an increase in the severity. As the amount of X-ray exposure was increased, there was a progressive attenuation of coccidial oöcysts. As the attenuation was increased, the severity of the disease from the treated cultures was decreased as indicated by the hemoglobin content. The attenuation of oöcysts by exposure to X-rays did not change within a period of 6 weeks. Chicks infected with a standardized X-ray-attenuated dose resisted a subsequent heavy reinfection almost as well as the survivors of a severe infection produced by untreated cultures.

The chemotherapy of infectious coryza with sulfathiazole: Correlation between feeding levels and blood concentrations, F. S. SCHLENKER, J. P. DELAPLANE, and H. O. STUART. (R. I. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 443-446, figs. 4).—The results obtained from the administration of sulfathiazole at the rate of 0.2 gm. per kilogram of body weight to eight cockerels have shown a rapid absorption of this drug to take place. "A peak concentration in blood is reached within 1½ to 3 hr. after oral administration when the birds are 'on feed'. An immediate drop takes place and then a slight rise, after which the residual amounts of the drug are eliminated. This regularity is forestalled when the drug is given in the absence of mash. No reason can be offered for these differences. The results indicate that from the standpoint of practicability it is necessary to keep sulfathiazole before the birds at all times in order to establish a constant effective level of the drug in the blood. A concentration of ¾ gm. of sulfathiazole per ounce of mash or greater (¼, ½, and 1 gm.) when fed ad libitum established a blood concentration which prevented the development of symptoms of coryza in artificially inoculated birds. When the drug level was lowered to ⅓ gm. per ounce, however, subclinical symptoms appeared. It is of interest to note that at a ¾-gm. level a maximum blood concentration of 2.4 mg. percent was established, whereas at the ⅓-gm. level this concentration was only 1.6 mg. percent. These results appear to be correlated with those obtained from cultural methods. It is possible that this lower level would prove effective in preventing the disease through contact exposure because of the great difference between the number of organisms used to inoculate the birds artificially and the relatively small number which would normally be present from natural exposure. From a practical standpoint the effective use of sulfathiazole would have to be based on knowledge concerning the status of the infection in each individual flock."

Gizzard erosions, their prevalence and significance, A. E. TEPER. (Univ. N. H.). (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 315-319).

The effects of variable dosages of sporulated Eimeria acervulina oöcysts on chickens, E. M. DICKINSON. (Oreg. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 413-424, figs. 4).—Report is made of studies of *E. acervulina* undertaken in an attempt to obtain information on (1) what effects variable dosages of sporulated oöcysts would have on body weight, egg production, feed consumption, symptoms, and mortality in susceptible chickens of different ages, (2) what dosages of sporulated oöcysts might be subclinical, clinical, or lethal, and (3) what effect continued feeding of sporulated oöcysts would produce in susceptible chickens. The effect of dosages of sporulated *E. acervulina* oöcysts that varied from approximately 5,000 to 25,000,000 of such oöcysts on egg production and body weight of Single Comb White Leghorn pullets of various ages is reported, the details being given in tables. The severity of the infection produced in

susceptible birds was in proportion to the number of sporulated oocysts administered in a single dosage. *E. acervulina* infection in susceptible pullets caused a loss in body weight and egg production, but was not considered a primary cause for mortality in these trials. Daily administration of 500,000 sporulated *E. acervulina* oocysts to susceptible pullets for 50 days did not produce a permanent or "chronic" detrimental effect. Protection or resistance against a heavy dosage of sporulated *E. acervulina* oocysts was consistently demonstrated in these trials. Although the resistance was sufficient to prevent gross clinical manifestations, it was not sufficiently solid to prevent a mild infection from occurring. The protection produced from a mild dosage of approximately 5,000 sporulated oocysts for 10 days appeared as solid as the protection from daily dosages many times that amount.

The stage in the life cycle of *Eimeria tenella* influenced by sulphur, O. E. GOFF. (La. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, p. 461).—In this series of experiments the first lot of chicks in each trial received sulfur 24 hr. before inoculation and continuously thereafter for the following 8 days. A second lot received sulfur 24 hr. before inoculation, but 24 hr. after inoculation the sulfur ration was replaced by the basal ration without sulfur. A third lot was inoculated and 24 hr. later given a ration containing sulfur which they received throughout the balance of the period. The sulfur was shown to have only a coccidiosis-preventive value. At 24-hr. intervals chicks from the various lots were selected at random and killed, ceca collected, and histological sections prepared and studied. Microphotographs were made of typical sections in each lot. A study of the material showed the stage in the life cycle of *E. tenella* affected by sulfur. The damage the parasite inflicted was also revealed.

Carriers of *Hexamita meleagridis*, W. R. HINSHAW and E. MCNEIL. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 453-458).—Studies of the incidence of *H. meleagridis* in adult turkeys that survived acute outbreaks and in other birds and animals killed on or near ranches where acute outbreaks had occurred and the results of some cross-infection experiments are reported. *H. meleagridis*, the cause of infectious catarrhal enteritis, was found in the intestine of 16.5 percent of live adult turkeys by rectal examination and in 32.4 percent at autopsy. In sexually immature birds the bursa of Fabricius was found to be a convenient source of material. The incidence of infection of *H. meleagridis* in adult turkeys is high enough to prove that the breeding stock is the most important source of infection. The domestic birds examined and found negative for *H. meleagridis* were chickens, pigeons, ducks, guinea hens, and peafowls. *H. columbae* was found in 8 (25 percent) of 32 pigeons examined. This species was not transmissible to poults. The game birds examined included quail, chukars, pheasants, sage hens, jungle fowls, and grouse. A species of *Hexamita* transmissible to poults was found in quail and chukars; the others were negative. Wild birds examined and found negative for *Hexamita* were blackbirds, English sparrows, linnets, butcher birds, towhees, hawk (1), owl (1), kingbird (1), and crow (1). Two toads and one alligator lizard were negative for *Hexamita*.

It was not possible to incriminate the fly as a carrier. The acute type of infectious catarrhal enteritis was produced in poults by oral and rectal injections of saline suspensions of *H. meleagridis* obtained from an adult carrier. This was accomplished by serial transfers in poults until heavy losses occurred in the group receiving the third serial injection. Cross-infection studies indicate that quail, chukars, and possibly ducks may act as carriers of *H. meleagridis*.

In an addendum it is stated that *H. meleagridis* persisted in the bursa of Fabricius and cecal tonsils for at least 22 weeks when the initial inoculation was made in chicks under 1 week of age. No symptoms of disease were ever produced. Because of these findings chickens also must be considered potential carriers, even though the parasite has not been found in farm flocks under natural conditions.

Experimental infection of chicks with *Hexamita meleagridis*, E. McNEIL and W. R. HINSHAW. (Univ. Calif.). (*Cornell Vet.*, 31 (1941), No. 4, pp. 345-350).—In inoculation experiments *H. meleagridis* was shown to persist in the bursa of Fabricius and cecal tonsils of chicks for at least 22 weeks when the initial inoculation was made in chicks under 1 week of age. Rectal inoculation proved the most efficient method for establishing the infection. It was impossible to produce symptoms of infectious catarrhal enteritis in chicks by serial passages in chicks. The degree of infection in chicks was very light when compared with the number of organisms found in poults. Normal chicks placed in a brooder with infected poults acquired the infection. Normal poults placed in a brooder with infected chicks likewise acquired the infection. The chicken must be considered a potential carrier of *H. meleagridis*.

A transmissible lymphoid tumor of the chicken, C. OLSON, JR. (Mass. Expt. Sta.). (*Cancer Res.*, 1 (1941), No. 5, pp. 384-392, figs. 7).—An account is given of a transmissible lymphoid tumor of the chicken, with the results of the first 30 serial passages. Transmission was accomplished by transplants of tumor tissue. These transplants failed to grow in some chickens, in others regression took place after a short period of growth, and in still others growth was progressive and in some instances metastasized to the visceral organs. The results gave no indication of an etiological connection between the lymphoid tumor, fowl paralysis, or fowl leucosis. The transmissible neoplasm is unlike any other transmissible tumor described in the chicken. A list of 26 references to the literature is included.

The effect of certain organic compounds and other dietary supplements on perosis, T. H. JUKES. (Univ. Calif.). (*Jour. Nutr.*, 22 (1941), No. 3, pp. 315-326, figs. 2).—Further experiments dealing with the relation of choline and other dietary supplements to perosis are reported (E. S. R., 85, pp. 97, 673). Twenty-four references to the literature cited are given.

Some problems concerned with the pullorum disease control program, H. R. BAKER (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 287-288).

Mapharsen therapy in enterohepatitis of turkeys, E. C. McCULLOCH and L. G. NICHOLSON. (Wash. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 11, pp. 574-576).—Experimental work indicated that the application of mapharsen (meta-amino-para-hydroxy-phenylarsine-oxide hydrochloride) therapy in the treatment of enterohepatitis of turkeys was safe and economical, and that it will save at least half of the birds provided adequate treatment is given within a reasonable time after clinical symptoms appear. Since it is known that approximately half of the liver function is impaired in enterohepatitis before clinical symptoms can be detected, and since the administration of therapeutic doses of this drug has no deleterious effect upon subsequent growth, it is suggested that all exposed birds be treated with light doses of mapharsen as soon as a diagnosis of blackhead has been established in the flock. It is possible that the dose of mapharsen can be reduced below 0.004 to 0.006 gm. per bird, especially in those cases where clinical blackhead has not appeared in the majority of the birds in a flock and repeated prophylactic doses may be indicated. These dosages would be proportional to the recommended dosages for humans if given to birds weighing between 10 and 15 lb.

Trematode parasites of Philippine vertebrates.—IX, Flukes from the domestic fowl and other birds, M. A. TUBANGUI and V. A. MASILUÑGAN (*Philippine Jour. Sci.*, 75 (1941), No. 2, pp. 131-141, pls. 3).—Of the nine fluke forms noted, *Prosthogonimus pseudopellucidus*, *Episthmium gallinum*, and *Brachylaemus malayensis*, all from the domestic fowl, together with *Mesostephanus fregatus* from the small intestine of *Fregata ariel ariel* and *M. haliasturus* from the small intestine of *Haliastur intermedius*, are described as new. Twenty-three references to the literature cited are included.

AGRICULTURAL ENGINEERING

Hydrologic studies of the Putah Creek area in the Sacramento Valley, California, M. R. HUBERTY and C. N. JOHNSTON (*Hilgardia [California Sta.]*, 14 (1941), No. 3, pp. 119-146, figs. 15).—The college of agriculture at Davis is located within the Putah Creek Basin, and in years of low rainfall, the underground basin is its sole source of water supply. The division of irrigation has observed underground-water conditions on the university farm for a long time.

Although shallow wells are affected by deep wells, their water-level fluctuations are in general out of phase with the deeper well levels, and they normally have water elevations higher than those of the deep wells nearby. In such areas as reclamation district 999, where shallow-water strata are under pressure, the surface layers may receive some water from the pressure-bearing strata below. Most of the ground-water supply of Putah Creek lower basin enters through the porous gravel beds near the head of the fan, in the vicinity of Winters. This area is potentially a great spreading basin. Although underground-water levels in the area north of Winters have been raised since 1912 by the use of the Capay Canal water, other parts of the area have had drops in water levels of from 15 to 25 ft. during the period. This lowering does not represent an overdraft, but rather the changes in head resulting from increased pumping. In dry periods, the recession is greater than usual. The recharge is good during years of normal or above-normal rainfall.

The boron content of the well waters varies widely. Cache Creek water imported into the district has had a marked influence upon some well waters. The data secured indicate a possible method of studying underground-water movements. The underground-water temperatures are uniform throughout the basin for all but the deepest wells, which tend to be several degrees warmer than the others.

Chemical composition of water in the Putah Creek Basin, C. S. BISSON and M. R. HUBERTY (*Hilgardia [California Sta.]*, 14 (1941), No. 3, pp. 147-160, figs. 2).—Within the period of time covered, water from wells perforated at one stratum only but of various depths was remarkably constant with respect to chemical composition. Wells perforated at more than one stratum showed a variable salt content. In general, ground waters of Putah Creek Basin were found of good quality for irrigation. The total salt content is relatively low as is the sodium percentage. Some well waters, however, contain sufficient boron to cause injury to many crop plants. The well waters of this area are characterized by a relatively high bicarbonate content. The sodium percentage was found to increase with depth of water-bearing formation. The boron content varied between 0 and 2.02 p. p. m.

The work of the United States Cotton Ginning Laboratory (U. S. Dept. Agr., Misc. Pub. 445 (1941), pp. [28], figs. 28).—This is a mainly popular account of the purpose, equipment, and accomplished work of the ginning laboratory at Stoneville, Miss. The study of the cotton before ginning has shown that

trash brought in by careless picking may cause losses of as much as \$5 per bale and that the most complete cleaning equipment does not entirely offset the results of careless picking. Development of mechanical driers which increase the value of the ginned lint by from 70 ct. to \$2.50, according to staple length, at a fuel cost often less than 15 ct. per bale, is mentioned, together with increases up to nearly 20 percent in gin capacity brought about by raising saw speeds from 400 to 600 r. p. m. at a cost negligible in comparison with the gain in value of the cotton gin which may be obtained from this change and from the concomitant use of looser seed rolls. Study of the effects of variations in gin-saw design and the importance to proper doffing of keeping the brush drums and brushes in good repair are also taken up, as are packaging improvements, pure-seed handling equipment, reduction in power wastes, etc.

Milk cooling on Kansas farms, J. ROBERTS and G. H. LARSON (*Kansas Sta. Bul. 295 (1941), pp. 39, figs. 18*).—This investigation has already been noted from another source (*E. S. R., 86, p. 398*).

AGRICULTURAL ECONOMICS

[Investigations of agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 213 (1941), pp. 183-185*).—An article on Tractors on Small Farms in Ohio, by F. L. Morison, is based on a study of farms ranging from 50 to 110 acres in a county in the western part of the State and a county in the north-eastern part. It includes tables showing for the farms grouped by type of power—horse only, horse and standard tractor, horse and general-purpose tractor, and tractor only (only the western county)—the average size of farm, number of men, crop acres, animal units, work units per man, and costs, total and per man work units, of labor, power, and machinery. The advantages and disadvantages of the different types of power for small farms are commented on briefly.

The usual table of index numbers (*E. S. R., 86, p. 262*) by J. I. Falconer is brought down through August 1941.

Types of farming in California analyzed by enterprises, L. A. CRAWFORD and E. B. HURD (*Coop. U. S. D. A.*). (*California Sta. Bul. 654 (1941), pp. 128, pl. 1, figs. 31*).—"The purpose of this bulletin is to present descriptive material of the natural and economic factors underlying and contributing to the development of this agricultural pattern so as to provide those interested in California agriculture with a general knowledge of the character of agricultural production in different parts of the State.

"There is presented first a brief review of the manner in which the underlying natural and economic factors operate in controlling agricultural production. This is followed by an illustrated description of the physiography of California to provide a basis of orientation and understanding of the crop and livestock localization in different parts of the State. The geographic distribution of the various crop and livestock enterprises is depicted graphically by means of dot maps of crop acreages and livestock numbers, followed by an explanatory discussion of the factors contributing to the enterprise localizations. Lastly, there is a graphic and descriptive presentation of the localization of various farm types as classified by the United States Bureau of the Census as a result of a special study of the 1930 Census of Agriculture."

Supplementary tables for Bulletin [377], types of farming in Montana, study of area IV: Its past, present, and future. (*Coop. U. S. D. A.*). (*Montana Sta. Mimeog. Cir. [13] (1938), [pp. 43], fig. 1*).—This circular supplements Bulletin 377 previously noted (*E. S. R., 83, p. 258*).

A study of dairy-farm management in Onondaga County, 1938 and 1939, R. W. HOECKER ([*New York*] *Cornell Sta. Bul.* 767 (1941), pp. 21).—Records of farm business were obtained and analyzed for 100 farms in the county for the crop year 1938, and 70 of the same farms for the crop year 1939. Tables are included and discussed showing data as to operator's ages, school attendance, tenure status, farming experience, etc.; kinds and costs of man labor; capital investment; farm receipts, expenses, and labor income; operator's privileges and earnings; etc. Analysis is made of the effects of size of business as measured by number of cows, by acres in cabbage, and by productive-man-work units, of diversity of farming, of labor efficiency, and of capital efficiency on labor income.

The average labor income for the 100 farms for the year ended March 31, 1939, was \$133, and on the 70 farms for the year ended March 31, 1940, \$498. The value of operator's privileges was approximately \$460 for each year. The increases in labor income in the 2 yr., respectively, due to increases in different factors were: One productive-man-work unit, 90 ct. and \$1.29; one cow, \$32 and \$44; one point in the crop index, \$13 and \$10; 1 cwt. of milk per cow, \$18 and \$14; one productive-man-work unit per man, \$8 and \$6; and 1-yr. decrease in the time required for the receipts to equal the capital, \$448 and \$422. "The most important factors affecting labor income both years were the total work units, crop index, milk per cow, and work units per man. Farms with none of these four factors as good as or better than average had a labor income of —\$344, while farms with all four factors as good as or better than average made a labor income of \$1,096, or a difference of \$1,440 per farm."

Planning the farm business in the Bluestem Belt of Kansas, R. J. DOLL (*Kansas Sta. Bul.* 294 (1941), pp. 23, fig. 1).—The area, the factors to be considered in farm business planning, and the preparation of farm budgets are briefly discussed. Budgets are prepared for five methods of using the farm resources of a 595-acre farm, with 140 acres of cultivated valley land, 5 acres of temporary pasture, 440 acres of upland pasture, and 10 acres of farmstead and waste land, and for five methods for a 320-acre upland farm, with approximately one-third of the land in cultivated crops. Tables list the standards—long-time average crop yields, man and horse work hours, seed, twine, fuel, and oil required for crop production, prices of different crops, and production and feed requirements for livestock—used in preparing the budgets. Other tables show comparisons of the acreages of different crops, numbers of different kinds of livestock, the production and gross receipts for each crop or kind of livestock, and the variable expenses under each method of organization for the two kinds of farms.

Factors affecting financial success of farms outlined, G. T. BLANCH (*Farm and Home Sci.* [*Utah Sta.*], 2 (1941), No. 4, pp. 2, 11).—This article is based on 442 farm business records of cash-crop dairy farms in the vicinity of Ogden, Utah, during 1937-39. The relation of different factors to labor earnings is discussed.

The average labor earnings of the 442 farms were \$881. Those of 29 percent of the farms were less than \$500 and those for 13 percent over \$1,500. The data indicated that to obtain the average labor earnings, it was necessary to be better than the average in more than three of the following factors: Number of man-work units, crop index, pounds of butterfat per cow, man-work units per man, percentage of man-work units in crops, price received per pound of butterfat, and man-work units for each \$1,000 of capital.

Some economic and social implications of the soil and water conservation program in the Little Mill Creek Watershed, Coshocton County, Ohio, R. H. BLOSSER. (Coop. U. S. D. A.). (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul.* 128 (1940), pp. [2]+36, fig. 1).—The locations, soil types,

land use, crop yields, livestock production, land tenure, labor income, etc., of the area are described. Surveys of the economic and soil conditions on 42 farms were made in 1935, 1936, and 1937. Records were kept by a group of the farmers who signed the cooperative agreements in 1938 with the U. S. D. A. Soil Conservation Service under its program which included adjustment of land use, application of lime and fertilizers, adoption of strip cropping, contours and cultivation on sloping lands, improvement of hay and permanent pasture lands, reforestation of steep and severely eroded lands, and elimination of oats and soybeans from rotations. The changes that have resulted and probably will result from 1935-37 due to the conservation plan with estimates of probable land use, value of crops, etc., are shown for an 80- and a 115-acre farm. How the conservation practices may affect the farm family and the difficulties of adopting the practices are also discussed.

The estimates indicated that the feed units of grain will be slightly reduced unless per acre yields are increased, that feed units of hay and pasture will be approximately doubled, that more labor will probably be needed to harvest the additional hay, and that on many of the farms 4 or 5 yr. will be required before the costs of adopting the recommended soil and water conservation practices will be completely recovered.

Economic geography of South America, R. H. WHITBECK and F. E. WILLIAMS, assisted by W. F. CHRISTIANS (*New York and London: McGraw-Hill Book Co., 1940, 3. ed., pp. XI+469, figs. [204]*).—Single chapters are devoted to the continent as a whole, and Colombia, Venezuela and the Guiana Colonies, Ecuador, Peru, Bolivia, Uruguay, Paraguay, and South America as a Whole and Some of Its External Relationships. Chile is dealt with in two chapters: The Country as a Whole and Its Northern Mineral Region, and The Central Valley and the South. Argentina is considered in three chapters: Argentina, The Pampa, and Satellites of the Pampa. Brazil is dealt with in four chapters: General Description, Interior Tablelands, and Southern States, The Heart of Brazil, The Tropical Northeast and the Amazon Valley, and Transportation, Manufacturing, and Commerce.

Agriculture in Uganda, edited by J. D. TOTHILL (*London: Oxford Univ. Press, 1940, pp. XVI+551, pls. [33], figs. [10]*).—This volume, prepared by the staff of the department of agriculture of Uganda, describes the topography, vegetation, climate, native agriculture, soils, erosion problems, manure, experimental work, native food crops, plantation crops, tobacco, oil-yielding plants, spices and drug crops, fibers, cover crops and shade trees, fruits and vegetables, grazing crops, bees and locusts, marketing, and agricultural education and extension work. Special consideration is given to cotton, coffee, and sugar.

Wheat in national diets, M. K. BENNETT (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 18 (1941), No. 2, pp. [2]+37-76, figs. 6*).—Wheat is one of the more important foodstuffs in a group designated herein as cereal-potato foods. This study presents analyses of the quantitative position of this group in the average diets of 52 nations (1933-38), the quantitative position of wheat calories among total food calories and among the cereal-potato calories of these nations, and changes in the position of wheat between 1923-28 and 1933-38. Calories from cereals and potatoes constitute as little as 30 percent of total food calories in some countries, as much as 90 percent in others. Wheat contributes less than 5 percent of total food calories in several countries, mostly Oriental or tropical; and as much as 40-50 percent in others.

Supply responses in milk production in southeastern Minnesota, E. G. STRAND and E. HOLE. (Coop. Minn. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 789 (1941), pp. 62, figs. 13*).—This study is one of the series (E. S. R., 85, p. 684),

the object of which is to compare the interregional competition between several dairy areas. The area dealt with in the present study embraces five counties—Dodge, Freeborn, Rice, Steele, and Waseca—in the southeastern part of Minnesota. The area is one of the most highly developed agricultural regions of the State and is in a transition area between the Corn Belt and the northern dairy region, and dairying is combined with the production of hogs, poultry, and cash grain. The agriculture of the area, the recent trend in production, and production trends and price relationships are described. Analysis is made of the production trends as shown by 24 accounting farms that had participated in the Southeastern Minnesota Farm Management Service during the period 1928-39 and by 150 farms in a survey sample in 9 adjoining townships in Freeborn, Waseca, and Steele Counties. Basic data for budget estimates of future production on individual farms in the area were drawn from these two selected sample groups. "The procedure has been to analyze the past trends in production for the area as a whole and then, by budgeting two representative groups of individual farms, to arrive at an estimate of the future production for the area in three possible future price situations: (A) A continuation of 1935 normal prices; (B) a 20 percent increase in butterfat prices; and (C) a 20 percent decrease in butterfat prices."

Butterfat production in the area apparently increased about 12 percent from 1927 to 1938. It is estimated that the milk production (for sale) in 1946 will be 9 percent greater than in 1936 if the 1935 normal price continues, 18 percent higher if there is a 20 percent increase in butterfat prices, and a decrease of 2 percent if butterfat prices are 20 percent lower. In summing up the authors state:

"Assuming continuation of the normalized prices prevailing in this area in 1935 (the A price situation), the normal production of butterfat in the area in 1945 will be increased by 9 percent over that in 1935. This increase will result not only from a small increase in cropland, but, more importantly, from the future expansion of alfalfa, the expansion of other high-yielding roughage crops, and the increased use of hybrid corn. The budgeting analyses revealed that hogs and poultry compete strongly with dairying in this area. Consequently, the added feed supplies, becoming available from hybrid corn and better feed-producing small grains, may tend to expand hogs and poultry more than dairying. Yet on farms where the possibilities of expansion in alfalfa or other roughage crops are as yet largely unrealized, dairying may increase just as much as hogs and poultry, and perhaps more.

"With an increase in the relative price of butterfat (the B price situation), some transfer of resources away from hogs, and to some extent from poultry, to dairy cows may be expected. The budgeting reveals, however, that even in this price situation dairying is not sufficiently superior on many farms to warrant more than a moderate increase in dairying at the expense of other enterprises. With a relative decline in prices of butterfat (the C price situation) production of butterfat is expected to be slightly less than the normal output in 1935. Budgeting of various farm organizations indicates that in this price situation alternative enterprises such as hogs, poultry, and beef cattle tend to become more profitable than dairying, and some contraction would be likely in the dairy enterprise. This contraction would be relatively larger than the estimated expansion in the event of an increase in prices of butterfat. The analysis of the interrelations of farm enterprises in this area and of the manner in which these enterprises would be affected by changes in price relationships should be of considerable value to individual farmers as well as to public agencies engaged in planning agricultural adjustments. Comparisons with areas in New England and in Wisconsin indicate that responses in dairy production are influenced by alternative enterprises and by changes within the dairy enterprise itself."

Proceedings of the conference of the American Society of Farm Managers and Rural Appraisers and the Appraisal Institute of Canada (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers*, 4 (1940), No. 3, pp. [2]+158, figs. 10).—Included are the following papers with discussions thereon presented at the conference held at Winnipeg, Man., June 25–27, 1940: The Need for and Proper Basis of a Sound Appraisal System, by R. R. Hudelson (pp. 18–31) (Univ. Ill.); Rural Appraising—Panel Discussion, conducted by T. D. Morse (pp. 31–34); Advance Preparation for Making an Appraisal, by C. N. Rogers (pp. 35–37); Appraisal Field Inspection, by H. B. Sommerfeld (pp. 38–50); Appraisal Plats, by H. Pike (pp. 51–55); The Earning Statement, by W. J. Smith (pp. 56–60); Comparative Adjustments, by E. E. McAnelly (pp. 61–65); The Appraisal Report, by E. Walley (pp. 66–68); Appraisal Reports, by H. C. Hall (pp. 68–70); Analyzing Appraisals Made by the American Appraisal System, by C. U. Jett (pp. 70–74); The Synthesis of Materials for Appraising, by C. H. Hammar (pp. 74–104) (Univ. Mo.); Farm Management in Relation to Rural Appraisal, by H. C. M. Case (pp. 104–112) (Univ. Ill.); Appraising Raw Lands in Western Canada, by W. E. Hobbs (pp. 112–137); The Appraisal of Undeveloped Land Which is Part of a Developed Farm Unit, by J. W. Canfield (pp. 137–141); Progress of Appraisal Technique and Practice in Western Canada, a symposium by F. W. Gulland, H. M. Morrison, A. R. Purchase, and W. J. Smith (pp. 141–147); and Development of Rural Appraisal Technique and Progress During the Last Few Years, by D. H. Doane (pp. 148–158).

Eighth annual report of the Farm Credit Administration (*U. S. Dept. Agr., Farm Credit Admin., Ann. Rpt.*, 8 (1940), pp. VI+292, figs. 21).—This report to the House of Representatives covers the operation of the farm mortgage credit system—Federal land banks, national farm loan associations, Federal Farm Mortgage Corporation, and Land Bank Commissioner loans; the production credit system—production credit corporations and credit associations; Federal intermediate credit banks; banks for cooperatives; emergency crop and feed loans; organizations in liquidation—regional agricultural credit corporations, loans to purchase stock in Agricultural Credit Corporations, Agricultural Marketing Act revolving fund, joint stock land banks, and joint stock land banks in receivership; and the several divisions of the Washington office.

The research work of the Administration is described.

Distribution of the total amount of short-term farm loans outstanding in Ohio from five lending agencies, P. S. ECKERT (*Ohio State Univ., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 138 (1941), pp. [1]+13, figs. 4).—Tables and maps show by counties the amounts outstanding June 30, 1939, on loans made by banks, production credit associations, the Farm Bureau Agricultural Credit Corporation, livestock marketing corporations, the U. S. D. A. Farm Security Administration, and the five agencies combined, and also the percentages each was of the total outstanding loans of the five agencies.

The farmer's taxes, new and old, M. W. ENGLISH (*Washington, D. C.: Natl. Highway Users Conf.*, [1941], pp. 51, figs. 15).—In a survey made in from 3 to 5 counties, total 71 counties, in California, Colorado, Indiana, Louisiana, Maryland, Minnesota, Missouri, New Hampshire, New Jersey, New Mexico, New York, Ohio, South Carolina, Tennessee, and Washington, the receipts from gasoline taxes and motor registrations averaged 80 percent of the receipts from property taxes of farmers, ranging from 37 to 149 percent in the States studied. With an increase of $\frac{1}{2}$ ct. per gallon in the Federal gasoline tax, it is estimated the average will be 85 percent and with a 1 ct. increase 96 percent.

Index of the laws pertaining to co-operation (*Works Prog. Admin. New York City [U. S.]*, Ser. A, pt. 1 [1938], pp. [2]+X+42).—This is the first of a

series of publications planned by the U. S. Works Progress Administration on cooperative organizations engaged in various types of economic activity. Federal, State, and Territorial laws in the United States are listed.

Abstracts of the laws pertaining to cooperation in the United States of America, its possessions and territories (*Fed. Works Agency, Work Proj. Admin. New York City, Ser. A, pt. 2 (1940), pp. [3]+VIII+350*).—This is the second publication of the series noted above.

Legal phases of cooperation (*Fed. Works Agency, Work Proj. Admin. New York City, Ser. A, pt. 3 (1941), pp. [5]+X+242+[1]*).—This third volume of the series noted above includes 265 references—general and on agricultural cooperation, consumer cooperation, credit cooperation, producers' cooperative associations, cooperative utilities, cooperative insurance, and cooperative education and recreation. An index of names and organizations, geographical and subject indexes, and an appendix showing the subsequent legislative action on the acts or proposed acts, are included.

Farmers' mutual fire insurance companies in West Virginia, M. A. ABRAHAMSEN (*West Virginia Sta. Bul. 302 (1941), pp. 43, figs. 2*).—This study was based chiefly on information as to methods of organization and operation of farmers' mutual fire insurance companies secured by interviews with each company, from financial records for each company obtained from the insurance department of the State auditor's office, and information furnished by approximately 600 farmers. The development of such companies, the trends in business operation, membership, policies, amount of insurance, etc., are described. Analysis is made of the kinds of property insured, hazards covered, risk classification, methods of collecting money, term of policies, reinsurance and concurrent insurance, risk inspection, salary and compensation practices, territory of operation, and the general operating practices—educational work, property valuation, maximum limits per single risk, adjustments, boards of directors, etc. Suggestions are made as to improvements of operating practices.

Fifteen of the 23 farmers' mutual fire insurance companies that had been incorporated in the State were active in 1939. The average amount of insurance in force, 1935-39, was \$70,411,531. The income per \$100 of insurance in force was 39.6 ct., and the fire loss 15.6 ct. In 1939, there were nearly 37,000 members holding about 43,000 policies amounting to \$76,801,000. Of the insurance in force, 70.8 percent was on rural and 29.2 percent on urban property. Only 10 of the companies insured losses due to lightning and only two companies insured against windstorm and hail. Five companies classified risks in detail, five used the system of partial classification, and five did not classify. Four companies operated on the deferred assessment basis, six on advanced assessments, and five on advanced premiums. Seven companies used perpetual policies, one a 1-yr. policy only, and the others policies for varying periods. Only four companies followed the practice of reinsuring their risks, and only two companies accepted other risks for reinsurance.

Ten companies reported writing concurrent insurance within their territory, and one such insurance outside its operating territory. Two companies made yearly risk inspections, two no inspections, and the remainder inspections at periods of from 3 to 5 yr. or from "time to time." Seven companies paid agents commissions and eight paid a flat fee or some modification of such procedure. In 6 counties 1 or 2 companies operated, in 9 counties 3 or 4 companies, in 33 counties 5 or 6 companies, and in 7 counties 7 or 8 companies.

"In general, it seems that the future of farmers' mutual fire insurance in West Virginia will depend primarily upon three factors and the ability of leadership to make adjustments in accordance with these factors. These factors are:

"(1) Giving attention to and incorporating all possibilities for increased efficiency and better service in the performance of various operating practices.

"(2) Eliminating costly and unnecessary duplication in services resulting from overlapping in the territories served by mutual companies (such duplication tends to increase costs to policyholders and also may result in inadequate and ineffective service).

"(3) Giving further attention to means of increasing policyholder participation in company operation and to bring about increased intercompany cooperation on all problems confronting farmers' mutual fire insurance companies."

Accounting for farmers' grain companies, J. R. RANDALL (*Jour. Accountancy*, 72 (1941), No. 5, pp. 437-447).—Accounting and auditing procedures applicable to farmers' grain companies are described. Illustrative forms are included.

Farm sales of Ohio milk through different outlets.—II, Akron-Canton Area: Carroll, Columbiana, Holmes, Medina, Portage, Stark, Summit, Tuscarawas, and Wayne Counties, C. G. McBRIDE and R. W. SHERMAN (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 131* (1941), pt. 2, pp. [2]-45, figs. 16).—This study is the second of a series previously noted (*E. S. R.*, 84, p. 265).

Marketing peanuts and peanut products, H. J. CLAY (*U. S. Dept. Agr., Misc. Pub. 416* (1941), pp. [2]-124, figs. 44).—This describes the commercial types and varieties of peanuts; the harvesting, curing, picking, threshing, and storing of the crop; the methods of marketing farmers' stock peanuts and the grades for such peanuts in different areas; the difference in prices for different grades; government control measures affecting the peanut enterprise; the operation of cleaning and shelling plants; grades and Federal inspection of shelled and cleaned peanuts; methods of disposing of such peanuts; transportation; the geographic distribution of shipments; the character of receipts in different markets; the Federal market news reports; the various peanut products; peanuts as a feed for hogs; foreign production, imports, and exports of peanuts and peanut oil; and other phases of the marketing of peanuts and peanut products. Lists of the literature cited and of the U. S. Department of Agriculture publications relating to peanuts and peanut products are included.

Market quality of Kansas potatoes as determined by Federal inspection, F. L. PARSONS. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 298* (1941), pp. 36, figs. 12).—The development of potato inspection work in the State, proportion of potatoes inspected, varieties shipped, classification by grades, defects, decay as a grade defect, cleanness, size, methods of loading, etc. are discussed. The appendix includes the U. S. standards for potatoes.

During the period 1935-39 about one-half of the potatoes shipped out of the State were Federally inspected. Thirty-two percent of the inspected potatoes during the period 1930-39 were U. S. No. 1, 51.4 percent U. S. Commercial, 12.7 percent U. S. No. 2, 3.1 percent unclassified, and 0.8 percent mixed. The percentages of the inspected potatoes showing different grade defects were: Cuts 54.9, second growth 43.2, scab 41.2, misshapen 31.7, wireworm injury 28.2, growth cracks 24.7, sun injury 22.9, bruises 19.9, mechanical injury 16.3, and other injury 16.2. No decay was reported for 47.1 percent of the cars inspected, 0.5 percent or less for 24.7, 0.5 to 1 percent for 25.7, and over 1 percent for 2.5. Only 19 percent of the U. S. No. 1 potatoes were graded as "clean" and 0.2 percent as "dirty." For U. S. Commercial potatoes, the percentages were 9.8 and 16.4, respectively, and for U. S. No. 2 potatoes, 6.7 and 42.7 percent, respectively. Eighty percent of the unclassified potatoes were so graded because of decay in excess of 1 percent. Approximately 75 percent of the potatoes inspected were designated as 1½ in. minimum size. Over 94 percent of the cars were loaded "summer style," but there is a growing tendency to use the "pyramid" style.

Farmers' marketing and purchasing associations in Tennessee, B. D. RASKOFF and P. W. VOLTZ (*Tennessee Sta. Bul. 177 (1941), pp. 59, figs. 13*).—This bulletin, which is a joint undertaking with the Tennessee Valley Authority, is part of a coordinated study in the Tennessee River drainage basin, conducted by the T. V. A. and land-grant colleges in the area. Schedules were obtained from the 62 farmers' marketing, and the 39 purchasing, cooperatives active in 1938 in Tennessee. The field data were obtained directly from association managers and records of the associations. County agents provided general information regarding the developments in their respective counties. In the discussion the marketing associations are divided into: Regional cooperatives, 5 in number; dairy cooperatives consisting of 2 milk bargaining associations, 5 creameries, and 2 cheese factories; fruit and vegetable cooperatives consisting of 9 strawberry, 6 sweetpotato, and 1 county growers' associations; livestock, wool, and poultry associations consisting of 4 livestock breeders', 2 poultry, and 25 livestock shipping and wool associations; and 1 grain-marketing association. The purchasing cooperatives consisted of 1 regional association, 3 independent local units, and 35 county farm bureaus and affiliates. The discussion of each type of cooperative includes sections on history, area served, organizational structure, financial analysis, and problems and programs. Generalizations as to Tennessee cooperatives are discussed under the following headings: Desirability of incorporation, necessity for sound financing, adequate compensation of officers and employees, improvement in membership relations, need for satisfactory records, possibilities of success, weaknesses of inactive associations, and opportunities for further development in Tennessee.

Report of the administrative official in charge of surplus removal and marketing agreement programs, 1940 (*U. S. Dept. Agr., Surplus Market. Admin. Rpt., 1940, pp. 83*).—This report to the Secretary of Agriculture, for the year ended June 30, 1940, covers the activities of the Federal Surplus Commodities Corporation and the Division of Marketing and Marketing Agreements. The role of surplus removal and marketing agreement programs; the surplus removal programs—direct purchases and distribution, surpluses for school lunches, the Food Stamp and Cotton Stamp Plans, wider outlets for surpluses, and encouragement of export sales; the marketing agreement programs and the improvement of markets for different agricultural products; and the results as to transportation rates obtained by the U. S. Department of Agriculture through negotiations and through formal actions before the Interstate Commerce Commission, are described and discussed.

Economic problems of the locker plant industry, R. J. EGGERT. (Kansas State Col.). (*Quick Frozen Foods, 4 (1941), No. 2, pp. 16-17, 32-34*).—This article is based chiefly on a study in progress at the Kansas Experiment Station. It describes the increase in the number of locker plants in Kansas and the United States during recent years. The possible savings by use of lockers are illustrated by preliminary figures comparing the costs of using locker service for beef and the costs of purchases from delivery and credit, cash and carry, and supermarkets in Manhattan, Kans., during March 1941. The further savings possible by taking advantage of seasonal price variations of different grades of steers, fat hogs, and fat lambs are discussed. The advantages and disadvantages of the use of locker plants are compared, the Kansas findings being supplemented by findings in studies in Minnesota and Illinois.

Trends in market prices for Montana farm and ranch products, H. G. HALCROW and J. G. DIAMOND. (Coop. U. S. D. A.). (*Montana Sta. Bul. 394 (1941), pp. 21, figs. 18*).—Tables show: (1) The average yearly prices, 1910-40 (shorter periods in some cases), received for crops commonly grown in the State

and for different kinds of livestock and livestock products, and (2) the average monthly prices, 1921-40. One series of charts shows the index numbers of the yearly prices, 1910-40, of the different products, and another series the monthly average prices, 1921-40, and also for wheat and beef cattle for the periods 1910-40 and 1931-40.

Statistical summary of prices received by Montana farmers and ranchers by months, August 1909-December 1940, H. G. HALCROW. (Coop. U. S. D. A. et al.). (*Montana Sta. Mimeog. Cir. 33 (1941), pp. [2]+71, figs. 2*).—This circular presents the statistical material upon which the bulletin noted above is based. It includes tables showing the monthly average prices received by Montana farmers and ranchers, and the index of such prices, for the major agricultural products during the period August 1909-December 1940. The method used in computing the index numbers is described.

Fixed prices for agricultural commodities (*Washington, D. C.: Chamber Com. U. S., 1941, pp. 22*).—This report of the Agricultural Department Committee of the Chamber of Commerce of the United States is entitled *An Analysis of Conditions Fostering Price-Fixing Proposals and a Survey of Price-Fixing Experience in Different Countries*. The committee's recommendations are: "In view of the record of failure of attempts at price fixing for agricultural products due to economic dislocations and restrictions on individual freedom and initiative, the committee recommends continued adherence to the long-established national policy under which price determination is accomplished through a system of freely operating marketing agencies. In any attempts, arising from a national emergency, to extend price control to a wide range of agricultural and non-agricultural commodities, the committee recommends that, in view of the inequalities produced by former attempts at price fixing, the method of control adopted be such as will insure to agriculture economic equality with labor and industry."

An appraisal of index numbers of prices farmers pay, J. DEAN and M. H. WISE (*Jour. Amer. Statis. Assoc., 36 (1941), No. 214, pp. 210-218, fig. 1*).—This revision of a paper presented before the American Statistical Association at Chicago, December 27, 1940, discusses the U. S. D. A. Index of Prices Farmers Pay, and suggests how it might be improved.

"In view of the desirability of using Fisher's 'ideal' formula for computing the index, the possibility of obtaining new weights each year by means of permanent, small stratified samples merits consideration. On the basis of the extensive Consumer Purchases Study, it might be possible to select a small number of families typical of each major region, farming type, and income group and to have these families keep records of their expenditures. The more homogeneous the subgroups the smaller may be the number of families sampled. Construction of subsidiary cost of living and cost of production indexes for various regions and types of farming seems desirable, even if the weights must be based on very small samples.

"Failing this, revision of the weights every few years seems desirable. The base period should probably be shifted to a more recent period, possibly 1935-39, if this becomes permissible under the revised statutes. Introduction of new commodities as soon as they assume importance in the budget, regardless of whether their prices are stable, is recommended. Although no satisfactory theoretical solution exists for the problem of the price at which the new commodity should be introduced, it would seem logical to have regard both for its price behavior while it was growing in importance and for the price of the commodities it supplements. Expression of prices of certain commodities in terms of units of service (e. g. tire miles and truck ton miles) rather than in terms of conventional units appears to merit further consideration."

Agricultural statistics, 1941 (*U. S. Dept. Agr., 1941, pp. [2]+731*).—This volume continues the series (*E. S. R., 84, p. 686*) and includes statistics prepared under the direction of the Yearbook Statistical Committee on grains, cotton, sugar, tobacco, fruits, vegetables, melons, tree nuts, miscellaneous crops, beef cattle, hogs, sheep, horses, mules, dairy cattle, poultry, and dairy and poultry products, foreign trade in agricultural products, farm business and related subjects, and miscellaneous subjects—forestry, weather, roads, etc.

Crops and Markets, [October–November 1941] (*U. S. Dept. Agr., Crops and Markets, 18 (1941), Nos. 10, pp. 221–244, fig. 1; 11, pp. 245–268, figs. 3*).—Each number includes crop and market reports of the usual types.

RURAL SOCIOLOGY

Larger population, more land in farms, bigger farms; but fewer farms, fewer tenants, growing more livestock, feed, F. WELCH (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 10, p. 8*).—The author reports that in the 1930–40 period, Mississippi's population increased by nearly 200,000, more land was brought into farms, farms increased in size, the number of farms and of tenants declined, the number of livestock increased, and more food was produced.

Acadian contracts in southwest Louisiana—some sociological observations, L. C. POST (*Rural Sociol., 6 (1941), No. 2, pp. 144–155*).—"Among the Acadians and other inhabitants who live in the cotton section of Lafayette Parish and the adjoining portion of Acadia Parish in southwest Louisiana many folk customs which fall under the headings of contractual arrangements and labor agreements are in operation. No matter how complicated an agreement may be, it usually takes only a few spoken words for its consummation. Some of the details, whether stated or implied, show peculiar twists and turns which, when thoroughly understood, give an intimacy with the culture of the region that perhaps can be gained in no other way. In the adjoining rice country markedly different arrangements prevail, differences obviously based upon differences in economic patterns and culture heritages."

The rice economy of Monsoon Asia, V. D. WICKIZER and M. K. BENNETT (*Food Res. Inst. [Stanford Univ.], Grain Econ. Ser. No. 3 (1941), pp. XIII+358, pls. 2, figs. 28*).—This book contributes to a better understanding of far eastern food problems and should stimulate further study in the years ahead.

Rural-urban conflict in Argentine sociological theories, W. E. MOORE (*Pa. State Col.*). (*Rural Sociol., 6 (1941), No. 2, pp. 138–143*).—"Although rural sociology as such has received scant attention in Argentina, . . . the adaptation of European theories to the interpretation of Argentine national history has resulted in considerable attention to the role of rural-urban conflict in the course of national development."

The complex farm-labor problem of South Africa, J. M. TINLEY. (*Calif. Expt. Sta.*). (*Rural Sociol., 6 (1941), No. 2, pp. 126–137, fig. 1*).—"The agricultural-labor problem of the Union of South Africa is complicated by the competition between commercial agriculture and industry for labor, by racial and cultural heterogeneity, by the impact of an exchange economy upon a primitive tribal economy, by the unbalanced distribution of labor supply in relation to industry, and by the pressure of population on land. The effects of these disturbing factors are evidenced by social and economic instability, problems of health and nutrition, and low standards of living. Efforts to increase the efficiency of native agriculture are being made, but funds available are woefully inadequate. The agricultural-labor problem cannot be solved without some modifications in the entire domestic economy of South Africa."

Trade unions in agriculture, H. W. SPIEGEL (*Rural Sociol.*, 6 (1941), No. 2, pp. 117-125).—"Two organization drives relating to farm labor are distinguished. The first reached its peak during the first World War, but the newly won ground was completely lost during subsequent years under the impact of changing technologies and the post-war agricultural depression. . . . The stronghold of organized farm labor is limited to the West. In appraising the extent of the new organization, account must be taken of the fact that many of its members are employed in occupations not strictly agricultural. . . . Nearly 40 per cent of all hired workers in agriculture are employed on farms reporting three or more hired laborers. Industrial disputes on farms reached a peak in 1933 and have abated since then. This seems to indicate that the organization of farm labor has been helpful in developing greater skill and statesmanship in the handling of these disputes. On the national scene, the growth of organized farm labor has resulted in increasing pressure directed toward the removal of the legal disabilities of that type of labor."

Recent changes in farm trade centers of Minnesota, L. NELSON and E. T. JACOBSON. (Minn. Expt. Sta.). (*Rural Sociol.*, 6 (1941), No. 2, pp. 99-106).—"The impact of the depression on Minnesota rural trade centers, as measured by the change in number of business units from 1929 to 1933, showed a rather marked decline of 7.5 percent for small centers and of 2.6 percent for medium sized places, while the larger centers actually gained by the slight margin of 1.1 percent. Moreover, the small places while losing more heavily during the depression years failed to gain as rapidly from 1933 to 1937 as did the medium and larger places. A large part of the 'recovery' gains in business units was in filling stations and eating and drinking establishments. Distance from a major trade center seems to influence the growth or decline of smaller places."

FOODS—HUMAN NUTRITION

Needed research in food and nutrition, J. WHITACRE. [Tex. Expt. Sta.]. (*Jour. Home Econ.*, 33 (1941), No. 9, pp. 648-650).—A classified summary of 618 problems on which research is needed. These were suggested by home economists in response to a questionnaire issued by the research committee of the Food and Nutrition Division of the American Home Economics Association.

Laboratory and business relationships in foods and nutrition, C. R. FELLERS. (Mass. Expt. Sta.). (*Jour. Home Econ.*, 33 (1941), No. 2, pp. 87-93).—An address.

The forty-fifth report on food products and the thirty-third report on drug products, 1940, E. M. BAILEY ET AL. (*Connecticut [New Haven] Sta. Bul.* 447 (1941), pp. 447-481).—This annual report (E. S. R., 84, p. 271), summarizing the results of regulatory examinations for the calendar year 1940, includes notes and certain data on fruit juice beverages, milk and milk products, skunk cabbage seed and pulp, rose hips, other food products, and drugs.

[Foods and nutrition studies by the New York State Station] (*New York State Sta. Rpt.* 1941, pp. 14-16, 20).—This is a brief progress report (E. S. R., 84, p. 693) of results obtained as to the processing of vegetable and fruit juices, the germicidal action of cabbage juice, and yeasts in fermented food products.

Food facts and fads, H. S. MITCHELL. (Mass. State Col. et al.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 7, pp. 667-670).—An address.

Stability of homogenized milk in cookery practice, H. HOLLENDER and K. G. WECKEL. (Wis. Expt. Sta.). (*Food Res.*, 6 (1941), No. 4, pp. 335-343).—Stability to coagulation as observed in milks used in the preparation of escalloped potatoes varied with potatoes of different variety, origin, and culture. In general, homogenized milk was relatively less stable to coagulation than was unhomoge-

nized milk. The effectiveness of added sodium citrate, phosphate, or carbonate in stabilizing homogenized milk appeared to depend upon the inherent characteristics of the potato used in the preparation of the cooked product. Acidity of the potatoes, however, was not a measure of their effect on the stability of milk.

Upon mixing with hot cooked cereal, the homogenized milk showed a greater tendency to coagulation than did the unhomogenized milk. The addition of sodium citrate to the cooked cereals prevented, and the addition of salt as seasoning delayed, the coagulation of milks, either homogenized or unhomogenized, when mixed with the cereal. Preheating of the milk did not increase its stability to coagulation when added to the cereals. Calcium chloride added to cooked cereal in amounts equivalent to 0.056 and 0.028 gm. per gram of oatmeal and wheat meal, respectively, caused rapid coagulation of the added milk. It is pointed out that a similar effect would be produced by water of sufficient hardness. The curd tension of egg custard prepared from homogenized milk was lower, and the serum separation greater, than when unhomogenized milk was used. There was a lower cooking temperature and apparently a more critical cooking temperature-time range for custards prepared from homogenized milk than for those from unhomogenized milk.

Sour cream: How to prepare and use it at home (*U. S. Dept. Agr. Leaflet 213 (1941), pp. 8*).—Directions for the home preparation of sour cream and recipes for its use in making dressings, as a garnish, and as an ingredient in baking and cooking are given.

Why eggs are classified as a protective food, R. V. BOUCHER. (Pa. State Col.). (*U. S. Egg and Poultry Mag., 47 (1941), No. 8, pp. 470-473, 512, figs. 8*).—This paper, presented as a popular talk, discusses the nutritive value of eggs in terms of their contribution of protein, minerals, and vitamins.

Chemical and histological studies of the disintegration of cell-membrane materials in vegetables during cooking, J. I. SIMPSON and E. G. HALLIDAY (*Food Res., 6 (1941), No. 2, pp. 189-206, pls. 6*).—To observe the effect of cooking on cell-membrane materials, chemical, histological, and microchemical studies described in detail and concerned with pectic substances and cellulose, were made on carrots and parsnips in the raw state (after treatment with alcohol to inhibit enzyme activity) and as steamed for different intervals. The data presented indicate that steaming (for 20 and for 45 min.) caused a progressive increase in the pectin content at the expense of protopectin which decreased in amount. These changes were accompanied by a slight increase in pectic acid (or pectates). Apparently some destruction of the pectin occurred, since there was a decrease in total pectic substances and since the decrease in protopectin far exceeded the increase in pectin. These changes were all slightly greater in carrots than in parsnips. Histological studies were made of paraffin sections of both raw and steamed vegetables, one series being stained with light green to show cellulose and another with ruthenium red to show pectic substances. Photomicrographs presented of representative sections of xylem and phloem tissues of the raw vegetables and those steamed 45 min. indicated that the cell walls of the steamed samples were less thick and less continuous than those of the raw ones. This disintegration is considered as an important factor in the loss of rigidity of vegetables during steaming. Microchemical tests on paraffin sections of both vegetables showed that steaming caused alterations in the cellulose component of the cell membranes.

Calcium firming of canned whole tomatoes, Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Canner, 93 (1941), No. 24, pp. 13-14, fig. 1*).—This brief survey points out that in 1941 approximately 1,000,000 cases of tomatoes were packed with the addition of calcium (*E. S. R., 81, p. 449*), this being applied chiefly in

the form of combination table salt-calcium chloride tablets now manufactured in three different sizes for No. 2, 2½, and 10 size cans.

Freezing preservation of fruits and vegetables, H. D. BROWN. (Ohio State Univ.). (*Quick Frozen Foods*, 3 (1941), No. 8, pp. 14-15, 33-35, figs. 3).—An address.

Nutritive value of quick frozen foods, F. FENTON. (Cornell Univ.). (*Refrig. Engin.*, 42 (1941), No. 2, pp. 140, 142).—A brief summary of a study noted earlier (E. S. R., 85, p. 571).

Factors that affect quality in frozen lima beans, J. G. WOODROOF and J. O. TANKERSLEY. (Ga. Expt. Sta. and Univ. Tenn.). (*Food Indus.*, 13 (1941), No. 4, pp. 53-56, figs. 6).—Tests have shown that maximum preservation of color, flavor, and nutritive value is attained only when all operations—shelling, grading, blanching, and freezing—are carried out in quick succession and as rapidly as possible. Freezing was found to reduce the cooking time of lima beans by about 10 percent. The weight and volume of the frozen beans increased about 10 percent upon cooking. Season and growing conditions were found to have a very great influence on the time required for cooking lima beans.

How locker plants control quality, H. H. PLAGGE. (Iowa Expt. Sta.). (*Food Indus.*, 13 (1941), No. 8, pp. 37-39, 40, figs. 3).—An address.

And now—quick frozen pies, cookies, cakes, and biscuits, G. L. SUNDERLIN and O. D. COLLINS. (Purdue Univ.). (*Quick Frozen Foods*, 3 (1941), No. 7, pp. 13, 44).—Freezing in airtight containers at -10° F. (and 0°) was found to be a satisfactory means of preserving roll dough, biscuit dough, pastry, pies, cooky dough, and cake batters. Maximum periods for successful storage varied from 1 mo. for baking powder biscuits and fresh peach pie to 4, 9, and 12 mo. for cake batter, pastry, and cooky doughs, respectively. Recipes used in the experiments on frozen batters and doughs are given.

Title 21—Food and drugs.—Chapter I—Food and Drug Administration. Part 15—Wheat flour and related products; definitions and standards of identity, W. B. MILLER (*Natl. Arch. U. S., Fed. Register*, 6 (1941), No. 103, pp. 2574-2582).—Findings of fact and regulations promulgated in the final order issued May 26, 1941, by the Acting Federal Security Administrator under the provisions of the Federal Food, Drug, and Cosmetic Act are presented "in the matter of a definition and standard of identity for each of the following foods: (A) Flour, white flour, wheat flour, plain flour; (B) enriched flour; (C) bromated flour; (D) enriched bromated flour; (E) durum flour; (F) self-rising flour, self-rising white flour, self-rising wheat flour; (G) enriched self-rising flour; (H) phosphated flour, phosphated white flour, phosphated wheat flour; (I) whole wheat flour, graham flour, entire wheat flour; (J) bromated whole wheat flour; (K) whole durum wheat flour; (L) crushed wheat, coarse ground wheat; (M) cracked wheat; (N) farina; (O) enriched farina; (P) semolina."

Under the promulgated regulations of this order, which becomes effective January 1, 1942, enriched flour conforms to the definition and standard of identity prescribed for flour "except that: (a) It contains in each pound not less than 1.66 mg. and not more than 2.5 mg. of vitamin B₁, not less than 1.2 mg. and not more than 1.8 mg. of riboflavin, not less than 6 mg. and not more than 24 mg. of nicotinic acid or nicotinic acid amide, not less than 6 mg. and not more than 24 mg. of iron (Fe); (b) vitamin D may be added in such quantity that each pound of the finished enriched flour contains not less than 250 U. S. P. units and not more than 1,000 U. S. P. units of vitamin D; (c) calcium may be added in such quantity that each pound of the finished enriched flour contains not less than 500 mg. and not more than 2,000 mg. of calcium (Ca), except that enriched flour may be acidified with monocalcium phosphate irrespective of the

minimum limit for calcium (Ca) herein prescribed; (d) it may contain not more than 5 percent by weight of wheat germ or partly defatted wheat germ; and (e) in determining whether the ash content complies with the requirements of this section allowance is made for ash resulting from any added iron or salts of iron or calcium. Iron and calcium may be added only in forms which are harmless and assimilable. The substances referred to in paragraphs (a) and (b) may be added in a harmless carrier which does not impair the enriched flour; such carrier is used only in the quantity necessary to effect an intimate and uniform admixture of such substances with the flour."

The same enrichments are prescribed for enriched bromated and enriched self-rising flours. The definition and standard of identity of enriched farina prescribes minimum supplements of vitamin B₁, riboflavin, nicotinic acid, and iron, and minimum optional additions of vitamin D and calcium corresponding to the minima noted above. In addition enriched farina may contain not more than 8 percent by weight of the optional ingredient wheat germ or partly defatted wheat germ; and not less than 0.5 percent and not more than 1 percent by weight of the optional ingredient disodium phosphate.

Title 21—Food and drugs.—Chapter I—Food and Drug Administration. Part 15—Wheat flour and related products; definitions and standards of identity, P. V. McNUTT (Natl. Arch. U. S., Fed. Register, 6 (1941), No. 234, pp. 6175-6176).—It is stated that the supply of riboflavin in forms suitable for addition to the enriched foods noted above is not sufficient to permit their production on a scale that would meet current needs but that such supply will be available July 1, 1942. "It is ordered, therefore, that the effective date of the requirements of said order that each pound of enriched flour, enriched bromated flour, enriched self-rising flour, and enriched farina contain not less than 1.2 mg. of riboflavin be postponed to July 1, 1942." This order was issued by the Federal Security Administrator November 29, 1941.

The milling aspects of fortified flour, D. W. KENT-JONES and A. J. AMOS (Lancet [London], 1941, I, No. 23, p. 731).—Referring to the British Government's scheme of enriching white flour through the addition of 0.2 gm. of synthetic vitamin B₁ to each sack (280 lb.) of flour, the authors point to the difficulty of uniform mixing of such disproportionate amounts and indicate that a more satisfactory method has been devised which involves the use of a concentrate. This is prepared by mixing 1 oz. of thiamin, dissolved in water, with a thin batter made of water and a 140-lb. portion of flour. This mixture is spray dried and the dried product incorporated at the rate of 1 oz. per sack to give the necessary $\frac{1}{40}$ oz. of the vitamin per sack.

The British proposal to add 8 oz. of calcium carbonate per sack presents no mechanical difficulties, but this calcium compound, because of its alkalinity, has caused some trouble since it reduces the acidity of the dough to a point where it is at times difficult to control the development of bacteria of the mesentericus group responsible for rope. It is further pointed out that there is some evidence that the calcium carbonate may result in the destruction of some of the thiamin during the baking process. Commenting on the plan (noted above) in use in the United States for enrichment of flour, the following is said:

"This presents a complex and difficult problem for all concerned, particularly the miller and the cereal chemist, and most people will be relieved that, so far at any rate, the authorities in England have not followed up 'fortification' with the same enthusiasm."

National flour for bread: M. R. C. specifications (Brit. Med. Jour., No. 4195 (1941), pp. 828-829).—On the basis of the recommendations of the Medical Research Council (British) (E. S. R., 84, p. 841), the Ministry of Food fixed the

degree of extraction at 85 percent and defined the flour as one obtained (1) by rearrangement of the milling machinery to produce a flour containing 85 percent of the wheat or (2) by addition to the white flour (73 percent extraction), obtained in the ordinary milling process, of combinations of the other fractions of the wheat. Comparative analyses, showing fiber, ash, protein, vitamin B₁, calcium, and phosphorus, of these two types (85 percent extraction), a white flour (73 percent extraction), and a whole-wheat flour are presented. Until the machinery adjustments necessary for the production of the first type of 85-percent-extraction flour can be made, the second type is recommended for adoption, this flour, as estimated from the comparative analyses, to contain not less than 1 International Unit of vitamin B₁ per gram and less than 0.9 percent of fiber (15 percent moisture basis). It is further recommended that flours be enriched with calcium carbonate to the extent of 7 and 14 oz. per sack (280 lb.) for the 73- and 85-percent extractions, respectively. The addition of iron salts is not recommended because of their possible deleterious effects on other nutrients present.

National flour (*Lancet* [London], 1941, I, No. 22, pp. 703-704).—Essentially noted above.

Wheat "peeling" process yields high-vitamin flour and bread (*Food Indus.*, 13 (1941), No. 5, pp. 70-71, figs. 4).—The flotation method borrowed from mining practice and developed by T. Earle as a process for removing the rough outer hulls from wheat kernels is described. This patented process consists in conducting the rough cleaned wheat through a series of 10 flotation cells into which wheat and water are fed in definite proportions and in which rubber-covered impellers vigorously rub the wheat against the rubber-lined sides of the cells, thus peeling off the wheat hulls. A flotation agent, pine oil, added to cause a froth, carries off the freed wheat hulls, while the peeled wheat carried along to the end of the chain of cells is discharged into a vibrating screen that removes most of the water. This peeled wheat, subsequently dried and tempered, is ground very fine, giving a golden-colored flour that retains most of the minerals and vitamins of the original wheat grain, but is lower in fiber content than 100-percent whole-wheat flour. Analyses of the flour gave the following values: Moisture 11.5, protein 15.2, minerals 1.63, crude fat 1.78, and crude fiber 1.38 percent, with a vitamin B₁ value of 965 International Units per pound. "Staff" flour (and bread) is the trade designation for this product.

Sugar rendering of lard increases stability, S. BULL. (Univ. Ill.). (*Food Indus.*, 13 (1941), No. 4, pp. 48-49, 97, fig. 1).—The addition of 0.5 percent of dextrose to fat kettle-rendered on a laboratory scale or steam-rendered commercially resulted in a lard with greater stability than the control product obtained without the addition of sugar. The former product had a slightly dark color and a slight odor and flavor of caramel. Decolorization of the sugar-rendered lard with fuller's earth produced a white product, which was less stable than the unbleached product yet more stable than the untreated lard. The degree of stability was judged by the rate of rancidity development upon bubbling air through the hot, melted fat under standard conditions. Cakes and pie crusts of satisfactory quality were obtained with the use of both the bleached and unbleached sugar-rendered lards.

Nutrition in defense, R. OVERSTREET. (Fla. Expt. Sta.). (*Citrus Indus.*, 22 (1941), No. 9, p. 19).—A brief statement noting a few of the available findings on the present state of the Nation's nutrition, and citing the simple diet recommendations of the National Nutrition Committee for Defense as a yardstick for family diets.

The national nutrition outlook, H. S. MITCHELL. [Mass. Expt. Sta.]. (*Jour. Home Econ.*, 33 (1941), No. 8, pp. 537-540).—An address.

The school lunch program and agricultural surplus disposal, H. M. SOUTHWORTH and M. I. KLAYMAN (*U. S. Dept. Agr., Misc. Pub. 467* (1941), pp. V+66, figs. 8).—"The supplying of surplus foods through the Surplus Marketing Administration is the primary concern of this report. Against a background discussion of the school-lunch movement in terms of nutritional need among children in the United States and previous experience with school feeding both here and abroad, it describes the S. M. A. program in operation, with emphasis upon its integration with the activities both of W. P. A. and of the other agencies and organizations, public and private, local, State, and national, that are active in school-lunch work, and attempts an evaluation of the program both as agricultural policy and as a contribution to child welfare."

From the viewpoint of agriculture, the program is considered to provide a particularly efficient method of surplus disposal, with little danger that the foods purchased will replace commercial sales that might otherwise have been made, but on the contrary a creation of new commercial sales of foods to supplement the surplus commodities used in these projects. From the viewpoint of child welfare, the program helps arouse public interest in child malnutrition, stimulates thousands of communities to local action, and brings together a wide range of organizations and agencies for coordinated effort toward solving the problem. "Greater contributions to child welfare could be made by the program if continued expansion of supplementary food-supplying projects were made with greater emphasis on nutritive value as a criterion in selecting foods."

The student dietitian: An experiment in cooperative education, M. A. OHLSON. (Iowa State Col.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 7, pp. 644-649).—An address.

Feeding our old fashioned children, C. A. and M. M. ALDRICH (*New York: Macmillan Co., 1941*. [3. ed., rev.], pp. [XI]+112, pls. 6).—In this revision of the book entitled *Cultivating the Child's Appetite* (E. S. R., 59, p. 189), the text has been rewritten to embody recent scientific evidence which "offers new solutions to feeding difficulties by diverting us from our absorption in food and turning us toward the children who do the feeding." Developments in biology, nutrition, mental hygiene, psychology, growth, and development are made use of to show "how children naturally go about the process of eating, and how this agreeable habit may be fostered."

Studies of blood of high school girls, J. M. LEICHSENRING, E. G. DONELSON, and L. M. WALL. (Minn. Expt. Sta.). (*Amer. Jour. Diseases Children*, 62 (1941), No. 2, pp. 262-272).—In a study of the blood of 258 normal high school girls ranging in age from 12 to 19 yr., counts and measurements of the red and white cells were made and hemoglobin content was determined. The hemoglobin values, which averaged 12.21 ± 0.80 gm. per 100 cc. of blood, were lower for the 14-, 15-, 16-, and 17-year-old groups than for the 12- to 13-year-old group, but rose again to the 12- to 13-year-old level in the 18-year-old group. The values for the red cell count, averaging $4,150,000 \pm 240,000$ cells per cubic millimeter, tended to follow those for hemoglobin content. The mean value for white cell count was $7,340 \pm 1,770$ cells per cubic millimeter. The proportion of reticulocytes averaged 1.08 ± 0.65 percent, and the mean diameter of the red cells was $7.90 \pm 0.20\mu$. The mean percentage of reticulocytes showed a gradual decrease with age, whereas the mean red cell diameter showed a slight increase. The mean values for the white cell count were not influenced by the age of the subjects. Of the two factors which may affect hemoglobin values and red cell counts in

adolescent girls, that is, the rate of growth and the periodic loss of blood, the data suggest that growth rate exerted the greater influence on the blood picture. The hemoglobin values, the red cell counts, and the percentages of young red blood cells were found to vary with the periods of the menstrual cycle.

The composition of gains made by rats on diets promoting different rates of gain, M. PICKENS, W. E. ANDERSON, and A. H. SMITH (*Jour. Nutr.*, 20 (1940), No. 4, pp. 351-365).—Five rates of gain were produced by dietary adjustment. These included rapid early gains of rapidly growing rats, early gains of normal (stock) rats, two rates of retarded growth, and an intermediate rate of gain obtained at a mature age during the recovery of stunted animals. At 42, 110, 230, and in the two stunted groups at 160 days also, animals were killed and analyzed for moisture, lipide, protein, and ash contents of their bodies, and the data for the individual animals were compared statistically. The results indicated that the early growth gains of the rapidly growing and normal groups were rapid and contained a preponderance of protein over fat, while later gains were made more slowly and involved the accumulation of large quantities of fat. The slight early gains of stunted animals also represented an accumulation of more protein than fat, but after realimentation with consequent rapid increase in weight, the animals added more fat than previously. "No single generality, therefore, relates rate of growth and composition of gains, but other factors such as age and nature of the diet appear to influence the composition of the gains." At the end of the experiment the fat-free matter of the bodies of all four groups was practically identical in composition. The iodine number of the body fat rose sharply between the first and fourteenth days, but did not significantly differ thereafter for animals of different age and dietary history.

Choline and epithelial hyperplasia in the forestomach of rats, G. R. SHARPLESS (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 487-488).—A further study of the factors responsible for the prevention of hyperplasia in the forestomach epithelium of the rat (*E. S. R.*, 84, p. 705) is reported, with the conclusion that one of the factors essential is choline. Of a group of 26 young rats fed for 6 weeks a basal diet of white flour 89, salts 5, butterfat 5, nicotinic acid 0.5, and cystine 0.5 percent supplemented with riboflavin, thiamin chloride, and pyridoxine hydrochloride to the extent of 0.4, 1.0, and 2.0 mg. percent, respectively, 18 developed typical lesions, while of 33 litter mates on the same diet supplemented with 0.15 percent of choline chloride only 5 had slight lesions. This observation is thought to explain why protein tends to prevent and fat to increase the hyperplasia of the forestomach epithelium, inasmuch as methionine and perhaps other amino acids have a cholinelike action and choline is required for normal fat metabolism or transport.

Gastro-intestinal motility in the albino rat after administration of amphetamine sulfate, E. SMITH and K. E. PENEON. (*Iowa State Col.*). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 418-419).—Measurements were made of the action of various doses of the drug on effective peristalsis and egestion time in intact animals and of the action on isolated segments of the colon. The results of these tests led to the conclusion that "amphetamine sulfate relaxes the stomach and small intestine, constricts the pylorus, and delays the passage of material along the gastrointestinal tract. Isolated segments of colon are stimulated by minimum effective doses; larger doses inhibit."

The effect of heat on the availability of the iron of beef muscle, H. G. OLDHAM (*Jour. Nutr.*, 22 (1941), No. 2, pp. 197-203, figs. 2).—Young rats made anemic on a basal milk diet were continued on this diet supplemented with copper and manganese and given daily supplements of ferric chloride, oven-dried (at 80° C.) meat, or vacuum-dried meat in amounts to furnish equal

amounts of iron. The response of the animals, as judged by the amount of hemoglobin formed, was the same with the supplement of oven-dried meat as with the ferric chloride, but significantly less hemoglobin was formed when vacuum-dried meat was fed. These results indicated that "heat renders the iron of beef muscle, of which at least 50 percent is in the organic form, as available for hemoglobin synthesis as the iron of an inorganic iron salt." This observation confirmed earlier results (E. S. R., 80, p. 559) showing that a normal infant could utilize the iron of cooked beef muscle as well as that of an iron salt.

The iron requirement of adults, A. P. BARER and W. M. FOWLER (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 8, pp. 769-778).—Forty-two patients with various pathological conditions, none of which involved blood loss, served as subjects in metabolism tests in which iron, nitrogen, and phosphorus balances were determined. Three carefully weighed diets, including neither liver nor spinach, were served to the patients. The average caloric value of the diets was 152 percent of the basal requirement, the average protein intake was 1.11 gm. per kilogram of body weight, and the average daily iron intake, as calculated from food tables and food consumption records, was 11.9 mg., with a range of 8.25-19.98 mg. Following a 3-day adjustment period on the diets, stool and urine collections were made, each of the pooled specimens being analyzed for nitrogen, phosphorus, and iron. Blood hemoglobin values were determined by the Newcomer method. The balance figures reported without any indication of the relative fecal and urinary excretions indicated that diets calculated as containing from 3.81 to 6.76 mg. of iron per day resulted in negative iron balance, whereas in the same patients a diet with from 12.22 to 15.33 mg. (calculated) of iron produced a positive balance. The authors interpret the results as suggesting that from 12 to 15 mg. of iron per day should be considered the minimum for adequate intake.

Hemoglobin values in Pennsylvania mass studies in human nutrition, P. B. MACK, J. M. SMITH, C. H. LOGAN, A. T. O'BRIEN, J. J. SHAW, and P. DODDS. (Pa. Expt. Sta. and State Col. et al.). (*Milbank Mem. Fund Quart.*, 19 (1941), No. 3, pp. 282-303, figs. 8).—Hemoglobin values obtained for 2,400 subjects in a mass study in human nutrition carried on in Pennsylvania from 1935 until 1940 with rural and urban families and school children in four typical communities revealed a distribution of hemoglobin values from less than 7.5 gm. to more than 13.0 gm. per 100 cc. of blood. There was no significant difference between hemoglobin values for boys and girls below 12 yr. of age, although beyond this age males were found to be significantly higher than females. Below 6 yr. of age the values were definitely lower than for other age groups. Both sexes showed marked increases during the ages when puberty is most likely to occur, after which values decreased sharply and remained at a constant average for age groups from 20 to 40 yr. and 40 yr. and older. The rural subjects were found to be more nearly uniform in value than urban, children of preschool age in the urban families were much lower than children of the same age among rural families, children in an economically depressed industrial community were exceptionally low in hemoglobin values as compared with those in other communities in better economic condition, and scattered cases of all sex and age groups in all parts of the State were far below the average for the group. These latter generalizations are interpreted to indicate that individual cases of poor nutritional status may be detected through low hemoglobin values even if the optimum status with respect to this value has not been ascertained for various ages of the two sexes.

Quantitative studies in the development of the rat molar.—I, The growth pattern of the primary and secondary dentin (from birth to 500 days of

age), M. M. HOFFMAN and I. SCHOUR. (Univ. Ill.). (*Anat. Rec.*, 78 (1940), No. 2, pp. 233-251, pl. 1, figs. 4).—The rate of apposition of primary and secondary dentin was studied in 63 albino rats from 1 to 502 days old. The animals were given multiple injections of 2 percent alizarin red S, the doses averaging 100 mg. per kilogram of body weight, and were sacrificed at different ages, for the preparation of ground sections of the molars. These sections showed a red line in the dentin which was calcifying at the time of each injection. Microscopic study of the sections with micrometer measurements between successive red lines in the primary and secondary dentin along the dentinal tubules indicated that the apposition of primary dentin starts at birth and continues up to about 135 days of age, with a daily rate of apposition ranging from approximately 16μ to 1μ . After 80 days growth ceases along the long axis of the pulpal surface and is confined to the roof and floor of the pulp chamber. The incremental pattern of the primary dentin is conical, with the apex toward the cuspal growth center. Rate of dentin growth is independent of body weight. In the secondary dentin apposition begins at 35-40 days of age concomitant with the clinical occlusion and continues as late as 500 days of age. In the pulpal horn the apposition shows a rate varying from 16μ to 1.3μ , with a conical incremental pattern having the apex toward the pulp. It is concluded that dentin growth is not uniform but proceeds along definite gradients, and that the primary dentin of the rat molar can be used as an indicator of experimental conditions in animals up to 100 days of age, vital staining with alizarin red S permitting quantitative study of the entire growth pattern.

The stimulatory effect of calcium upon the succinoxidase activity of fresh rat tissues, A. E. AXELROD, K. F. SWINGLE, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 140 (1941), No. 3, pp. 931-932).—The succinoxidase activity of rat liver, as measured by oxygen uptake in the presence of succinate, was found to be stimulated by the addition of Ca (20γ as CaCl_2 per 40 mg. of liver furnishing from 4γ to 8γ of Ca), the increase amounting to from 43 to 80 percent with minced liver and to 93 percent with homogenized liver. The addition of cytochrome *c* (3×10^{-8} mole per flask) decreased the magnitude of the stimulatory effect to 48 percent. Succinoxidase activity of homogenized kidney cortex (20 mg. per flask) was stimulated 40 percent in the presence of the added Ca and was not affected by cytochrome *c*. The most pronounced effect of Ca was observed in the case of homogenized heart tissue (20 mg. per flask) in which the addition of 20γ of Ca in the presence of 3×10^{-8} mole of cytochrome *c* caused an increase of 200 percent in succinoxidase activity.

The influence of fat on calcium and phosphorus metabolism, J. H. JONES (*Jour. Nutr.*, 20 (1940), No. 4, pp. 367-376).—The synthetic rachitogenic diets fed to young rats in the present study were similar to those previously described (E. S. R., 81, p. 879). Diet 570, containing 1.1 percent of calcium and 0.09 percent of phosphorus, was modified by the addition of lard or other substances at the expense of the carbohydrate, the substitution being on a weight basis in some cases and on a calorie basis in others. Calcification, as judged by bone ash, line test, and serum calcium and phosphorus values, was definitely increased by lard at levels varying from 5 to 25 percent on either the weight or the calorie basis. This increased calcification was not associated with the nonsaponifiable portion, as shown by other trials in which this material in amounts equivalent to 50 percent of the original fat was used in place of the lard. With a slight change in salt mixture so that the calcium content of the diet was but moderate (0.38 percent), the lard still effected increased calcification. Upon reduction of the phosphorus to very low levels (0.02 percent), the effect of the lard was less pronounced than on diets higher in phosphorus. Uncombined oleic acid was

almost as effective as lard in antirachitic activity, but sodium oleate and the calcium soaps of lard failed to be effective. These results are interpreted to disprove the theory that fats act by forming calcium soaps, thereby increasing the absorption of this element. Other theories advanced to explain the action of fats in favorably influencing calcium and phosphorus utilization are discussed in the light of the present findings. The data are considered to disprove the several theories except for the one explaining the action of the fat on the basis that it increases the acidity of the intestinal tract, and thus admits of subsequent greater absorption of calcium and phosphorus.

The effect of dietary calcium and phosphorus on the assimilation of dietary fluorine, M. LAWRENZ and H. H. MITCHELL (Ill. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 1, pp. 91-101).—The effect of varying levels of dietary calcium and phosphorus on the deposition of dietary fluorine (9, 12, and 32 p. p. m.) in soft tissues, skeleton, and teeth was determined in experiments with growing rats receiving equalized portions of comparable rations and sacrificed for analysis after consuming definite quantities of ration. Comparison of analyses of these rats with those of control animals analyzed at the beginning of the experiment permitted estimation of fluorine retention. The results indicated that an increase in dietary calcium from 0.23 to 0.73 percent, phosphorus remaining constant, produced heavier dry fat-free skeletons with higher percentages of ash, calcium, and phosphorus, but depressed the total retention of fluorine by from 10 to 13 percent, this effect being more noticeable in teeth and soft tissues than in bones. An increase in dietary phosphorus from 0.14 to 0.71 percent, dietary calcium remaining constant, produced a heavier dry fat-free skeleton, but did not modify appreciably the total retention of fluorine or the distribution of retained fluorine among bones, teeth, and soft tissue.

"Presumably dietary calcium consumed in concentrations above certain minimum (inadequate?) levels, protects the body against dietary fluorine, in food or in water, by impairing its assimilation to some extent, especially in those tissues, the teeth and the soft tissues, where its most deleterious effects would be exerted."

Chronic endemic dental fluorosis (mottled enamel), M. D. CLAWSON, E. S. KHALIFAH, and A. J. PERKS (*Jour. Amer. Dent. Assoc.*, 27 (1940), No. 10, pp. 1569-1575).—By way of review, the lesion of mottled enamel is described and classified into six recognized types according to degree of severity; a brief historical survey is presented of the studies leading to the establishment of the etiologic factor in the mottling of human enamel; preventive measures are discussed; and several measures suggested for removing (not curing) the unsightly mottling of endemic fluorosis are outlined.

Areas of endemic fluorosis not previously mentioned in the literature are reported from western Asia. The current report deals with investigations of the water supply for fluorine content and with the dental conditions of the present inhabitants of the ancient city of Palmyra. It is believed that enough proof is available from water analyses and observations "to declare the whole of the Arabian Peninsula, Asia Minor, the Near East, and Mesopotamia endemic, in scattered sections at least, to this water-borne mottling of human teeth." Specifically, "three areas were positively identified in Iraq, two in Trans-Jordan, two in Syria, one in Bahrein Islands, two in Trucial Oman, Arabia, and one in Palestine."

Further observations on the influence of dietary protein on the toxicity of selenium, M. I. SMITH and E. F. STOHLMAN (*Jour. Pharmacol. and Expt. Ther.*, 70 (1940), No. 3, pp. 270-278, figs. 2).—Lactalbumin, ovalbumin, gelatin, and the proteins of wheat, dried brewers' yeast, and desiccated pork liver,

supplied at a 20 percent level, replacing the starch of the basal diet which carried 10 p. p. m. of naturally occurring wheat selenium (from 50 percent of seleniferous wheat) and 10 percent of protein, afforded protection against the toxic effect of this selenium. Not only did these protein supplements admit of normal growth of the rats, as judged by comparison with control animals receiving similar diets containing nonseleniferous wheat, but they offered protection against all the toxic manifestations of selenium poisoning, such as effusions, anemia, and liver injury. This protective action of dietary protein against the chronic toxicity of ingested selenium confirms the results previously observed (E. S. R., 83, p. 141) with casein. *d*-Lysine (1.7 percent) and *dl*-methionine (0.8 percent) were without effect, and glucosamine (2 percent) afforded only partial protection. "Experiments with graded increments of the protein casein showed that the degree of protection against 15 p. p. m. inorganic selenium fed as sodium selenite is related to the quantity of protein in the diet. Cystine and methionine in amounts sufficient to support normal growth in rats on a diet containing only 4 percent casein failed to mitigate the toxic effects of the selenium."

Wall chart: A guide to vitamins and minerals in the family meals, J. E. RICHARDSON and J. T. CHASE (*Montana Sta. Cir. 165 (1941), pp. 4*).—This convenient chart lists the amounts of vitamins and minerals recommended by the committee on food and nutrition, National Research Council, May 1941, as the daily allowance per person, and lists amounts of each of these (vitamins A, B₁, C, riboflavin, Ca, P, and Fe) to be found in serving portions of common foods. A sample menu based on these foods includes all daily allowances.

The vitamin content of meat, H. A. WAISMAN and C. A. ELVEHJEM (*Minneapolis, Minn.: Burgess Pub. Co., 1941, pp. [I]+II+210*).—This book, in processed form, summarizing available information on the nutritive value of meat and meat products, is based on data assembled from the literature and on analyses and assays made in the authors' laboratory. It is pointed out that the values presented are not final and must be considered as subject to such revision as future work may dictate. Individual chapters are devoted to the more important nutrients, vitamins A, D, E, K, and C, thiamin, riboflavin, nicotinic acid, pyridoxin, pantothenic acid, additional factors newly recognized as vitamins, and proximate constituents. Sufficient information is supplied in each case so that the value of meat in meeting the requirements for these nutrients can be considered in the light of the most recent developments. Specifically, the physiology, pathology, and therapeutics of the vitamins are discussed, and, where available, information is given on the influence of cooking on the vitamin content of meat. Currently acceptable assay methods, including biological, microbiological, and chemical techniques are discussed briefly, and the procedure used in the authors' laboratory for preparation of the samples is described. A summary chapter gives general values for the vitamin content of the most important forms of meat products.

Retention of vitamins by dried fruits and vegetables, E. M. MRAK (*Univ. Calif.*). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 21 (1941), No. 1, pp. 13-15*).—Presented as an address, this brief survey indicates that (1) steam blanching tends to preserve vitamins A, B₁, and C in dehydrated vegetables; (2) sulfuring preserves A and C, has no effect on riboflavin, and tends to destroy B₁ in dried fruits; (3) dehydration is superior to sun-drying from the standpoint of vitamin retention; (4) alkaline dips have no destructive effect on vitamins A, B₁, and riboflavin; and (5) loss of vitamins A and C by dried fruits increases as SO₂ content decreases, the destruction of vitamin A and probably vitamin C being rapid in fruits containing less than 400 p. p. m.

of SO₂, and the loss of SO₂ being more rapid from fruit containing from 18 to 20 percent moisture than from that containing from 12 to 14 percent.

Changes in dietary value during food preservation, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 2, pp. 40-42).—An address summarizing briefly the changes in mineral constituents, vitamins A, B₁, and C, and riboflavin, generally occurring in the processes of blanching, sterilizing, freezing storage, sun-drying, and fermentation (alcoholic and lactic).

What vitamins mean to the quick frozen food industry, H. H. PLAGGE. (Iowa Expt. Sta.). (*Quick Frozen Foods*, 3 (1941), No. 9, pp. 24, 39-40).—An address.

The question of the synthesis of vitamin A from carotene in the rat [trans. title], H.-J. BIELIG (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 266 (1940), No. 1-3, pp. 112-116, fig. 1).—No difference was observed in the onset of xerophthalmia in similar groups of rats kept on a vitamin A-free diet in the dark and under continuous irradiation with a daylight lamp, or in the cure of xerophthalmia and resumption of growth following the administration of β -carotene to both groups. This is considered to indicate that the synthesis of vitamin A from carotene in the body of the rat does not depend upon the action of light on epithelial pigment.

Effect of reduced evaporation on the provitamin A content of lettuce in refrigerated storage, R. S. HARRIS and L. M. MOSHER (*Food Res.*, 6 (1941), No. 4, pp. 387-393, fig. 1).—Throughout this study the lettuce used was obtained at the same stage of maturity from the same greenhouse, and the sound washed leaves were sorted at random into five lots, one of which was used as fresh lettuce, while the other four were used after 7 days' storage in which they were held, respectively, in the open compartment or the vegetable hydrator of two refrigerators identical in type with those used in a previous study (E. S. R., 85, p. 706). Average temperature and relative humidity in the open compartments were 40.7° F and 69.1 percent and 41.6° and 88.0 percent in the two refrigerators, respectively, with the corresponding hydrators at 45.6° and 96.1 percent and 41.2° and 98.3 percent. Air movement in the four cases averaged about 10 ft. per minute, 2 ft. per minute, very low, and virtually nil.

The loss of provitamin A in the lettuce was determined by bio-assay procedure (U. S. P. XI, second supplement) in which the lots of stored lettuce were fed to groups of 50 avitaminotic rats at levels sufficient to produce growth equal to that obtained in a similar group of animals fed the fresh lettuce. The relative provitamin A potencies of the four lots of stored lettuce as compared with that of the unstored lettuce taken as 100 were 69, 82, 92, and 95, respectively. These figures indicated greater retention upon storage in the hydrators where relative humidities were higher and air movement lower than in the open compartments, and in the open compartments greater retention in the refrigerator kept at the higher humidity. The extent of provitamin A destruction did not correlate with the difference in temperature during storage as well as with the percentage loss of moisture. The rate of destruction during dehydration appeared to be linear until about 40 percent of the weight was lost, then the destruction appeared to be accelerated. The lettuce became wilted by the time it lost 30 percent of its weight, and wilting, therefore, could be used as an index of loss in initial provitamin A content. Since moisture loss is a function of relative humidity and air movement, it appears that high humidity and low air movement are important in the preservation of the vitamin content of vegetables stored in the refrigerator.

Relationship of vitamin A blood level in the rat to vitamin A intake and to liver storage, J. M. LEWIS, O. BODANSKY, K. G. FALK, and G. MCGUIRE (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 248-250).—When the vitamin A intake of rats was less than 50 International Units daily, the concentration in the blood was directly related to the consumption. Above 50 I. U., the daily intake had no effect on the amount of vitamin A in the blood, but the storage in the liver continued to increase. There were 100 I. U. per 100 cc. of blood with an intake of 50 I. U., and only 110 I. U. when 1,000 I. U. per day were consumed. Under these conditions the vitamin A storage in the liver increased from 228 to 10,000 I. U. per liver. There was no liver storage with less than 37 I. U., and little up to 53 I. U. per 100 cc. of plasma.

Dark adaptation and experimental human vitamin A deficiency, S. HECHT and J. MANDELBAUM (*Amer. Jour. Physiol.*, 130 (1940), No. 4, pp. 651-664, figs. 3).—Because of differences reported in the literature concerning the time when a rise of the visual threshold first appears in dark-adaptation tests during the period of a vitamin A-deficient diet, the effect of single large doses of vitamin A following a deficient diet, and the rate of recovery of the visual threshold on return to a normal diet, the authors have made a detailed study of these points on 17 male subjects between 21 and 30 yr. of age. The procedure for the dark adaptation test with the Hecht apparatus "involves light adaptation to 1,500 millilamberts of 3 min., and measurements during the subsequent darkness of the threshold of a retinal area 3° in diameter situated 7° nasally for flashes of violet light 0.2 sec. in duration."

All but 3 of the subjects responded almost immediately to the A deficiency by a rise in visual threshold, which continued throughout the period on the deficient diet. The others required 22, 55, and 60 days, respectively, before a definite and continuous rise in threshold occurred. None of the subjects showed any skin changes and only 2 recorded symptoms of night blindness. The presence or absence of other vitamins in the diet had no effect on the visual threshold. Among 9 subjects tested with single doses of vitamin A, variable results were obtained. In no case was the recovery complete and in all the effects were only temporary. With resumption of a normal diet or with continued supplementation of the basal diet with vitamin A, permanent recovery was variable but slow. In one subject 6 weeks were required for return to normal. At the other extreme was a subject who showed but little improvement in over 3 mo., but recovered completely in a year.

A note on the distribution of vitamin B₁ (thiamin) in the rice grain (*Malayan Agr. Jour.*, 29 (1941), No. 3, pp. 127-128).—By chemical methods for detecting thiamin it was indicated that about 50 percent of the thiamin content of the rice grain was concentrated in the embryo.

The functions of diphosphothiamine (phosphorylated vitamin B₁), E. S. G. BARRON and C. M. LYMAN (*Science*, 92 (1940), No. 2389, pp. 337-338).—A brief report in given of in vitro experiments with rat kidney and liver slices, demonstrating that "the synthesis of carbohydrates and of citric acid with pyruvate as one of the substrates is diminished in tissues from avitaminotic rats and is increased on addition of vitamin B₁. They are offered as evidence for our view that vitamin B₁ is a catalyst not only for oxidation and decarboxylation of pyruvate, but also for many other reactions where pyruvate is one of the reacting substances."

Vitamin B₁ in the urine after the administration of larger doses [trans. title], I. MAGYAR (*Klin. Wchnschr.*, 20 (1941), No. 17, p. 425).—The author suggests the possibility of a more effective utilization of vitamin B₁ when massive doses are prescribed if the dosage is distributed through the day rather than given at one time. In support of this suggestion, data are given showing ex-

tremely large amounts of the vitamin excreted by patients with various diseases when treated with vitamin B₁ in single daily doses of 100 mg. and the much lower excretion of the vitamin by two healthy subjects during a 12-hr. period following four doses at 3-hr. intervals of 10 mg. of the vitamin as compared with a single dose of 40 mg.

Clinical experiences with the measurement of the urinary excretion of vitamin B₁. G. A. CARDEN, W. D. PROVINCE, and J. W. FERREBEE (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 1-5).—Using a modification of the Hennessy and Cerecedo thiochrome method (E. S. R., 82, p. 588), the authors measured the 24-hr. urinary excretion of vitamin B₁ of a small group of normal subjects (interns) on their usual diets and of a similar group of hospital patients suspected of vitamin B₁ deficiency. The response of the normal group to a 0.5-mg. test dose injected subcutaneously and of a number of the patients following vitamin B₁ treatment in various dosages was also determined.

The normal subjects excreted from 108 to 390 μ g. of vitamin B₁, with an increase of from 10 to 40 percent of the added dose in the tolerance test. The 24-hr. excretion of the patients suspected of vitamin B₁ deficiency ranged from 5 to 70 μ g., and approximately normal increases following the test dose were for the most part obtained only after several doses. Although it is recognized that further work is necessary before accurate interpretation of B₁ tolerance tests can be attempted, the evidence is considered conclusive that subjects who have been on low vitamin B₁ diets excrete less than the usual amount of vitamin B₁ in the urine, and the more deficient subjects show a lessened excretion of B₁ following the administration of small doses of the vitamin. It is thought of interest that in a year no patient was found whose excretion of vitamin B₁ could not be raised to normal by the administration of quantities of vitamin B₁ comparable to those obtainable in ordinary diets.

Effect of processing on the vitamin B₁ content of foods, R. S. HARRIS, B. E. PROCTOR, S. GOLDBLITH, and J. BRODY (*Inst. Food Technol. Proc.*, 1 (1940), pp. 109-121).—The summary, based on comparatively recent findings reported in the literature, points to the losses of thiamin entailed in the production of refined cereals and cereal products; in the pasteurization of milk and production of evaporated and condensed milks, and to the slight destruction in the manufacture of dried milks; to the variable destruction of the vitamin in cooking and its loss through the discard of cooking waters; and to the slight effect of rapid dehydration, freezing, and ordinary storage on the thiamin content of foods. Original data on canning losses are presented. To obtain information on this matter, tests were conducted on 25 samples of vegetables and fruits which were prepared and packed in a manner similar to commercial procedures and processed in an experimental canning laboratory. Samples of the fresh foods taken at the time of canning were assayed by a fluorometric procedure, and the assays were repeated on samples taken immediately after canning and again after 50 days. The thiamin determination was made by a modification of the Hennessy and Cerecedo method (E. S. R., 82, p. 588). The modifications consisted of "digestion of the macerated tissue by 3 percent, rather than 2 percent, acetic acid; concentration of the food thiamin by passage through 80 mesh, rather than 30 mesh, exchange zeolite; and elimination of sodium sulfate as a dehydrating agent. Furthermore, the fluorophotometer was standardized directly against synthetic thiamin chloride and not against quinine sulfate." The method was found to give results agreeing within 10 percent of those obtained by bio-assay. The recorded losses in the experimental canning of fruits and vegetables varied from 0 in orange juice to as high as 88 percent in grapefruit segments. It is pointed out that the extent of destruction in the various

foods was similar to that noted by others in the cooking of the same types of foods by cooking procedures. From 24 to 51 percent of the thiamin of the vegetables canned was found in the juice after canning.

A report on loss of vitamin B₁ in baking, C. G. HARREL, R. C. SHERWOOD, B. SULLIVAN, and W. L. RAINEY (*Southwest. Miller*, 20 (1941), No. 24, pp. 19, 31).—This paper presents the findings by a subcommittee of the technical committee of the Millers' National Federation on vitamin B₁ loss in baking. The work, done by four collaborators, consisted in determining by the thiochrome method the vitamin B₁ content of crust, crumb, and whole loaf of 1-lb. loaves of thiamin-enriched bread baked in a commercial rotary oven equipped with steam or in a laboratory forced-draft oven. The flours used were enriched with synthetic thiamin or with thiamin-rich yeast. Doughs at the molding stage from the corresponding bakes were also analyzed. The samples of breads and doughs were air-dried before distribution for analysis under code numbers.

The limits of vitamin B₁ losses in baking were found to vary from 6.8 to 29.1 percent between the two extremes of baking conditions. Little difference between the two forms of enrichment was apparent, and practically all the loss of vitamin B₁ occurred in the crust. In the crumb the average loss was 4.6 percent. The loss of vitamin B₁ increased greatly with increased baking time (at constant temperature) and with increased temperature of baking (time remaining constant). Under medium conditions (30 min. at 425° F.), which gave a very well-baked commercial loaf, the vitamin B₁ loss was approximately 16 percent, while with a somewhat lighter bake (20 min.) the loss averaged approximately 10 percent. It is pointed out that time, temperature, oven load, type of bake, size and shape of pan, type of oven, and pH of dough are all factors affecting vitamin B₁ losses, and that the average losses obtained in this study can be considered at best as only approximating the loss for any particular baking condition.

This collaborative study showed further the desirability of tested standards for the analytical work and the need for great precautions to insure complete extraction of the vitamin B₁ from the bread samples.

Vitamin B₁ loss in baking, C. G. HARREL, R. C. SHERWOOD, B. SULLIVAN, and W. L. RAINEY (*Bakers Digest*, 16 (1941), No. 3, pp. 42-45).—Essentially noted above.

Physiological activity and experimental clinical use of vitamin B₆ (pyridoxine) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+35*).—This review, under date of August 1941, is presented under the headings chemical and physical properties, history, occurrence, physiological activity (in rat, dog, and chick, and miscellaneous effects), clinical uses, dosage and methods of administration, toxicity, and methods of assay. A bibliography of 94 titles is appended.

Toxicity of pantothenic acid, K. UNNA and J. GRESLIN (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 311-312).—In continuation of the studies on the toxicity of the various vitamins of the B complex (E. S. R., 84, p. 563), preliminary findings are reported demonstrating that "calcium pantothenate is, like other members of the vitamin B complex, a substance of extremely low toxicity. Excessively large doses (0.8 gm. to 10 gm. per kilogram, depending on the mode of administration) were found to produce death due to respiratory failure in mice and rats. Prolonged feeding of sublethal doses failed to produce toxic manifestations, indicating that an excess of pantothenic acid is either rapidly destroyed or excreted."

Riboflavin deficiency among Chinese, I, II, H. C. HOU (*Chin. Med. Jour.*, 58 (1940), No. 6, pp. 616-628, pls. 2; 59 (1941), No. 4, pp. 314-325, pls. 2).—This paper is presented in two parts as follows:

I. *Ocular manifestations.*—From an out-patient eye clinic in a Shanghai, China, hospital which examines about 150 new patients monthly, 36 cases were selected over a period of 3 mo. for observation and treatment of eye lesions suggestive of riboflavin deficiency. Four out of 9 pellagrins admitted to the hospital during the same period were similarly treated after cure of the pellagra by nicotinic acid as a supplement to a pellagra-producing diet.

The ocular lesions in order of decreasing frequency among the 36 nonpellagrins were pericorneal injection, bulbar conjunctivitis, photophobia, vascularization of the cornea, blurring of vision, phlyctenules in the conjunctiva or cornea (a sign of ariboflavinosis not pointed out before), corneal opacity, corneal ulcer, blepharitis, and iritis. Riboflavin was administered usually by mouth, starting with 15 mg. in three separate doses for the first day or two, then 10 mg. daily for from 3 to 10 days, depending upon the severity of the disease, and finally 5 mg. daily for another week. Within 24 hr. definite relief from photophobia was experienced, followed within 48 hr. by improvement in bulbar conjunctivitis, phlyctenules, corneal vascularization, and pericorneal congestion. In 4 or 5 days healing was practically complete, with the exception of corneal ulcers which healed more slowly and usually left a trace of corneal opacity. Cheilosis and glossitis, observed in only 5 of the cases, were cured within from 4 to 7 days and seborrheic lesions in from 10 days to 2 weeks. The effect of carotene in massive doses was tested in a few cases before initiating riboflavin treatment or as a substitute for riboflavin during treatment but with no success.

The eye lesions in the pellagrins, which consisted only of pericorneal injection and bulbar conjunctivitis in a mild degree, showed no change under nicotinic acid therapy but responded rapidly to riboflavin and more slowly to yeast. Three case reports are given in detail, and photographs are included illustrating the various types of ocular lesions.

II. *Cheilosis and seborrheic dermatitis.*—Ten children selected from a refugee camp where a large number had cheilosis, chiefly of the milder type, and 10 pellagrins showing cheilosis and/or seborrheic disease were treated for riboflavin deficiency as in part 1 and with equally good results. It is considered of interest that cheilosis and ocular lesions, although responding to the same treatment, seldom occurred together, but that cheilosis was quite common among the pellagrins. It is suggested that the ocular manifestations may represent a pure riboflavin deficiency and cheilosis a riboflavin deficiency, with possibly a very mild degree of nicotinic acid deficiency.

A new factor of the vitamin B complex required by the albino mouse, E. R. NORRIS and J. HAUSCHILDT (*Science*, 92 (1940), No. 2388, pp. 316-317).—In a study of the requirements of the albino mouse for the various factors of the vitamin B complex skin lesions, as well as failure to grow, were observed on a basal vitamin B complex-free diet supplemented with pyridoxin, thiamin, nicotinic acid, and riboflavin, with the addition of a filtrate from a fuller's earth adsorption of either yeast or liver. The skin lesions are said to be similar to those described by György and Eckhardt (*E. S. R.*, 83, p. 713), but to differ in certain respects from them and other skin lesions described in the literature. "The paws, ears, nose, and tail, and in most cases the eyes appear normal. In a few cases a sticky exudate is observed about the eyes. The lesions are preceded by loss of hair on the abdomen, closely followed by the appearance of shiny skin in the inguinal region. This in turn is soon followed by a scaly dandruff-like appearance beginning almost simultaneously on the back of the neck and in the inguinal region. If the animal survives this stage of the deficiency, the pelt frequently begins to come off in large plaques, particularly on the back, leaving a dry but otherwise normal-appearing hairless skin. . . . In some cases, the

peeling off of the pelt does not occur, but instead the dandruff-like appearance spreads over the body and the hair gradually falls out, leaving the animals covered with dry white scales."

Ascorbic acid content of pigmented fruits, vegetables, and their juices, M. M. KIRK and D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Food Res.*, 6 (1941), No. 4, pp. 395-411).—This paper presents in detail the findings summarized in an earlier report (E. S. R., 85, p. 134).

Fruits showed daily variation in ascorbic acid content, associated probably with differences in part of the season, ripeness, amount of sun, and quantity of rain. There were also decided varietal differences and differences depending upon the part of the fruit analyzed. Thus, peach skins contained from two to four times as much ascorbic acid per gram as the pulp, and eggplant skins were richer in this vitamin than the rest of the fruit, with little difference between the portion immediately under the skin and the center portion. The ascorbic acid content of 11 varieties of strawberries varied from 0.40 to 1.04 mg. per gram, of 7 varieties of raspberries from 0.13 to 0.30, of 6 varieties of blueberries from 0.12 to 0.20, of 5 varieties of plums from 0.03 to 0.10, of 2 varieties of cherries from 0 to 0.09, of 11 varieties of peaches from 0.06 to 0.14 (in the pulp), and of 5 varieties of turnips from 0.32 to 0.48 mg. per gram. Eggplant of the Black Beauty variety, averaging for the entire fruit 0.05 mg. of ascorbic acid per gram, showed but small losses in storage. Much vitamin C of fruits was lost in preparing them for juicing, but such loss was inhibited by heating (between 140° and 170° F.). The pressing process caused some loss of ascorbic acid, and the addition of sugar to the fruit juice caused further loss, apparently due to oxidation by air incorporated in stirring in the sugar. Apple juice as commonly prepared was very low in ascorbic acid (from 0.01 to 0.02 mg. per gram). With Greening and Cortland varieties much of the ascorbic acid was retained in the pomace after pressing out the juice, but this was not true of Baldwin apples.

Changes in vitamin C content of Bartlett pears in cold and gas storage, D. K. TRESSLER and J. C. MOYER. (N. Y. State Expt. Sta. et al.). (*Food Res.*, 6 (1941), No. 4, pp. 373-376).—Fruits grown in a commercial orchard in the Niagara peninsula in Ontario were harvested when their ground color was beginning to turn from green to yellow and placed in cold storage at 30° F., half of them being held in large open cans and half in smaller sealed cans having either a $\frac{5}{64}$ - or a $\frac{7}{64}$ -in. (diameter) hole in the lid. Fruits analyzed when freshly picked showed an ascorbic acid content of 0.090 mg. per gram (0.62 mg. per gram, dry-weight basis). Those held in open storage lost vitamin C rapidly, decreasing to 0.064 mg. per gram (0.42, dry basis) in the first month and to 0.049 mg. per gram (0.33, dry basis) after 2 mo., with little change thereafter. After 3 mo. the quality of these fruits began to decline. Fruits held in the closed cans where the atmosphere was found to contain 2-4 percent CO₂ and 17-19 percent O₂, depending upon the size of the diffusion hole, lost ascorbic acid less rapidly than fruits held in open cans. The pears held in gas storage were sound in quality at the end of 7 mo., at which time they contained 0.051 and 0.036 of ascorbic acid per gram (0.36 and 0.26 mg., dry basis) when held in cans with the smaller and larger diffusion holes, respectively.

Vitamin D content of dairy products—methods of fortifying milk, K. G. WECKEL. (Univ. Wis.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 133-137).—This brief survey deals with the occurrence and stability of vitamin D in milk, with the variation in the amount naturally present, and with the several methods of increasing the vitamin D content of dairy products.

Effect of renal damage on the toxicity of hypervitaminosis D in rats, L. OPPER. (Ark. Expt. Sta. and Univ.). (*Arch. Pathol.*, 31 (1941), No. 5, pp. 569-577, figs. 4).—Forty rats on a diet furnishing an average daily intake of

vitamin D were made markedly deficient in vitamin A several times in the course of a 4- to 7-mo. period. At autopsy these animals showed extensive renal damage, and 37 of them showed extensive arterial calcification commensurate with the degree of renal damage. Controls receiving the same diet but not depleted in vitamin A showed no tissue calcification. In another group of 27 rats kidney insufficiency was produced by partial nephrectomy, and large doses of vitamin D as viosterol (13,000-29,000 units) were then administered daily over a period of from 6 to 19 days. At autopsy, tissue calcification was found to be very pronounced. Control rats (not operated on) received somewhat larger average daily supplements of vitamin D, yet their tissues revealed no calcification. Blood serum removed at autopsy from the nephrectomized animals and the controls not operated on averaged, respectively, 20.67 and 12.52 mg. of inorganic P and 13.77 and 13.36 mg. of Ca per 100 cc. These findings indicate that renal damage, whether produced by chronic vitamin A deficiency or by partial nephrectomy, may influence the toxicity of excessive vitamin D in the diet. The blood picture suggests that high serum P rather than high Ca is significant in the calcification of the soft tissues and that one of the causes of elevation in the inorganic P of the blood is renal insufficiency.

Routes of administration of materials capable of acting as vitamin K, E. J. DEBEER, L. DREKTAR, and B. FLUSSER (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 535-537).—Studies of the blood clotting time in chicks when 2-methyl-1,4-naphthoquinone was administered orally, intramuscularly, and percutaneously in lieu of vitamin K showed that as little as 1 γ per chick percutaneously reduced the clotting time of 11 of 24 chicks to 10 min. or less 24 hr. after dosing.

The avitaminoses, W. H. EDDY and G. DALLDORF (*Baltimore: Williams & Wilkins Co.*, 1941, 2. ed., pp. XIII+519, pls. 41, figs. 28).—A revision of the volume previously noted (E. S. R., 77, p. 891).

A note on the interrelationship of deficiency diseases and resistance to infection, J. W. RIDDLE, T. D. SPIES, and N. P. HUDSON. (Ohio State Univ. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 361-364).—In 150 selected cases of clinical pellagra, riboflavin deficiency, and beriberi with other associated deficiency diseases, the bacterial flora of the lesions associated with the various deficiencies was studied, complement titrations were made with venous blood, and the bactericidal power of the whole blood for *Staphylococcus aureus*, *Streptococcus viridans*, and *Neisseria intracellularis* was measured. A definite relationship was evident between the deficiency diseases and the resistance to and presence of infections with *Staphylococcus aureus* and *Streptococcus hemolyticus*. The lesions at the corners of the mouth characteristic of riboflavin deficiency contained pure or nearly pure cultures of hemolytic strains of *Staphylococcus aureus* in 80 percent of the cases, with *Streptococcus hemolyticus* predominating in the remaining 20 percent. The lesions healed rapidly and the organisms disappeared following oral or intravenous administration of riboflavin. Hemolytic strains of *Staphylococcus aureus* were isolated from the bacterial flora of the eyes in 14 of 30 cases of conjunctivitis. The presence of *Corynebacterium xerosis* was demonstrated in nearly all cases and in a pure state in Bitot's spots occurring in 5 of the patients. In 64 percent of ulcerations of the tongue, sinus, and buccal mucosa *Streptococcus hemolyticus* (in addition to masses of Vincent's organisms) was found and hemolytic strains of *Staphylococcus aureus* in the remaining 36 percent. Within 48 hr. following specific therapeutic treatment with substances rich in the vitamin B complex the ulcerated areas decreased in size and healed, and the organisms disappeared.

Acute deficiency was associated with low complement titer and subclinical and mild deficiency with slightly subnormal or normal titer. In the whole blood

of patients with acute deficiency there was a distinct depression in the bactericidal power for *S. aureus*, as compared with only a slight decrease in subclinical and mild cases of vitamin deficiency.

TEXTILES AND CLOTHING

The Planoflex, a simple device for evaluating the pliability of fabrics, E. C. DREBY (*Jour. Res. Natl. Bur. Standards [U. S.]*, 27 (1941), No. 5, pp. 469-477, pls. 2; also in *Amer. Dyestuff Rptr.*, 30 (1941), No. 24, pp. 651-654, 665-666, figs. 2).—The instrument, described and illustrated, serves to measure the angle to which the strip (3 by 10 in.) of fabric, held under a 2-lb. tension in a horizontal plane, may be shifted to the right or the left in its plane without producing longitudinal surface wrinkles. Results of measurements on 19 cotton percales showed an 88 percent correlation with factual pliability ratings representing the average of judgment of eight textile men experienced in handling fabrics of this type; evaluation of pliability by the Schiefer Flexometer and the Peirce Hanging-Heart Loop methods gave correlations of 88 and 51 percent. The Planoflex was found to be well-adapted to testing a wide variety of woven fabrics, although it could not be used indiscriminately to evaluate the relative pliabilities of fabrics of different fiber construction. Heavily starched fabrics did not give measurable results on it, and knit fabrics were too easily distorted and stretched to give values of any significance. The instrument is recommended because of its simplicity of construction and operation, its direct readings, and the requirement of but few specimens to give a reproducible average value.

Role of cystine in the structure of the fibrous protein, wool, W. I. PATTERSON, W. B. GEIGER, L. R. MIZELL, and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 27 (1941), No. 1, pp. 89-103, figs. 4).—The behavior of wool in a series of highly specific reactions was observed, the results suggesting that a number of its important physical and chemical properties are associated with the presence of disulfide cross-linkages between polypeptide chains of the protein. Whereas strongly alkaline solutions of thioglycolic acid dissolve the protein of wool and destroy the fibrous structure, neutral or acid solutions of the reagent can reduce wool over a wide range of pH without destroying the fibrous structure. Such reduced wool can easily be oxidized. In the reduction the disulfide cross-linkages between the polypeptide chains of the protein are reduced to sulfhydryl groups which are capable of reacting readily with the alkyl halides to form thioether groups. Reaction with alkyl monohalides, such as methyl iodide, apparently causes permanent rupture of the disulfide linkages, since the resulting fibers are greatly increased in extensibility and reduced in strength. These, as well as the reduced fibers, are much more soluble in alkali than untreated wool. Alkylation of the reduced wool with alkyl dihalides, such as methylene iodide, introduces hydrocarbon chains between pairs of cystine molecules in the fibers. The resulting fibers are very similar to the untreated ones in physical properties but possess much lower alkali solubility. It is suggested that this latter reaction, wherein relatively unstable disulfide cross-linkages are converted to extremely stable thioether cross-linkages, may be useful in overcoming the susceptibility of wool to degradation by alkali.

Microscopic structure of the wool fiber, C. W. HOCK, R. C. RAMSAY, and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 27 (1941), No. 2, pp. 181-190, figs. 16; also in *Amer. Dyestuff Rptr.*, 30 (1941), No. 18, pp. 449-456, 469-470, figs. 16).—Whereas untreated wool was not readily attacked by pepsin, wool that had been reduced with thioglycolic acid and then methylated was

attacked by the enzyme even at room temperature so that after several days the fibers lost their luster and became striated, due to increased prominence of the cortical cells. After long treatment large numbers of these cells were liberated from the fiber. Placed in fresh enzyme for a month, some of the liberated cells appeared to be digested while others remained intact, the differences being apparently associated with the extent of reduction of the wool and suggesting that the undigested cells were the ones in which the disulfide cross-linkages were intact. Microdissection of liberated cortical cells showed their striated appearance to be due to the presence of many fibrils which could be separated with micro-needles. Near the center of each cell there was a granular nucleus. Between crossed nicols the fibrillar part appeared birefringent, whereas the nucleus did not.

The scale cells were not appreciably attacked by the pepsin, but remained attached in the form of tubes, with the scales overlapping, as the cortical cells were digested. Under the microscope the scale cells showed no fibrillar structure; between crossed nicols they appeared nonbirefringent. The root and the shaft showed numerous differences in cellular structure and micro-chemical color tests. These and other observations indicated that as the cells of the root emerge into the shaft physical and chemical changes take place simultaneously. The Allwörden reaction, involving the formation of sacs upon the surface of a wool fiber immersed in chlorine water, appeared upon microscopic examination to be associated with sac formation on the scales of the shaft. Scales loosened from the fiber by treatment with concentrated sulfuric acid or formic acid showed that the swelling occurred between the upper and lower surfaces of individual scales. Response to certain chemical treatments suggested that the formation of sacs was associated with the reaction of the chlorine with the disulfide groups of the cystine in the scales. Numerous photomicrographs are given.

Nature of the resistance of wool to digestion by enzymes, W. B. GEIGER, W. I. PATTERSON, L. R. MIZELL, and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 27 (1941), No. 5, pp. 459-468, pls. 3; also in *Amer. Dyestuff Rptr.*, 30 (1941), No. 24, pp. 659-664, figs. 3).—Wool fibers that have not been injured mechanically or modified chemically were not attacked by solutions of crystalline pepsin, trypsin, chymotrypsin, or papain, as judged by the fact that the load required to stretch the relaxed fiber (immersed in water or neutral buffer) until elongated 30 percent was the same after treatment with the enzyme as it was before. When the cuticle or scale layer of the fibers was damaged by mechanical means the fibers became susceptible to attack by pepsin and chymotrypsin, which liberated cortical and scale cells but did not digest them; the microscopic appearance of the fibers suggested that an intercellular substance may have been digested. This enzyme action weakened the fibers so that they broke at 5- to 10-percent elongation.

Wool fibers in which the disulfide cross-linkages were broken by reduction with thioglycolic acid or by reduction and subsequent alkylation were rendered extremely susceptible to digestion with pepsin or chymotrypsin but were attacked only slightly by trypsin. The enzyme action consisted of digestion of the cortical material, liberation of some of the cortical cells, and formation of empty tubes of scales. Such fibers were so fragile that they broke into small pieces upon attempt to remove them from solution. When the reduced wool was reoxidized and its sulfhydryl groups were converted to disulfide groups, the wool regained its original stability. When the sulfhydryl groups of the reduced wool were converted to bis-thioether groups by the action of an aliphatic dihalide, the stability of the wool toward enzymes was greatly enhanced.

Physical and chemical properties of flannels containing different proportions of new and reprocessed wool, B. BAILEY. (S. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 10, pp. 583-598).—Wool flannel fabrics containing different blends of new and reprocessed fiber were manufactured, using identical spinning, weaving, and finishing processes. Chemical and physical tests were applied to the fabrics as received from the manufacturer and after varying numbers of commercial dry cleanings and pressings.

"Comparisons of the fiber qualities of the new and reprocessed wool indicated that the new wool was finer, longer, and crimpier. No difference in average contour ratio was found. Ash and nitrogen were greater in the new fiber, whereas the sulfur content was lower. Examination of the fundamental properties of the four fabrics manufactured indicated that, when fibers of the nature described were used for blending, an increase in the percentage of reprocessed wool resulted in an appreciable decrease in the weight per square yard, though the number of yarns per inch decreased only slightly and the twist remained approximately the same. Comparisons between the diameter of the fibers in the finished fabrics and those in the new and reprocessed wool from which the fabrics were made indicated that the coarser reprocessed fiber must have been eliminated to a certain extent during manufacture. Determinations of the moisture, ash, nitrogen, and sulfur content of the fabrics before and after dry cleaning and pressing showed that the ash tended to increase with dry cleaning; that neither blend nor treatment affected the sulfur content appreciably; and that in all blends there was a marked increase in nitrogen between the fifteenth and thirtieth dry cleanings.

"Statistical methods were applied in the analyses of the effects of abrasion and dry cleaning and pressing on the four fabrics. Nonsignificant differences in strength between unabraded fabrics and fabrics abraded 1,000 times were found. However, there was a decrease in elongation following abrasion.

"When the interpretation of the results of the application of the analysis of variance was limited to comparisons between the four fabrics studied, it was found that the fabrics were significantly different in strength and elongation; the treatments to which they were subjected were significantly different; and in some instances they did not react similarly to treatment. Expanding the interpretation to indicate the general effects of blending new and reprocessed wool of the types used in this study in manufacturing flannel fabrics resulted in the conclusion that fabrics of different strength and elongation are produced, regardless of subsequent dry cleaning and pressing processes to which they may be exposed. Thus, regardless of the method of interpretation, it was found that increases in the percentage of the reprocessed wool used in this study resulted in corresponding decreases in fabric strength and elongation. The effects of dry cleaning and pressing were mixed and therefore inconclusive."

Fabric properties of blends of new and reprocessed wool, B. BAILEY. (S. Dak. Expt. Sta.). (*Textile Res.*, 11 (1941), No. 7, pp. 314-319, fig. 1).—Essentially noted above.

The sulfuric acid and aluminum chloride carbonization methods for the determination of wool in mixed fabrics compared in an inter-laboratory study, L. E. WEDENHAMMER, F. A. PRISLEY, and B. A. RYBERG. (U. S. D. A. et al.). (*Amer. Dyestuff Rptr.*, 30 (1941), No. 14 pp. P348-P357).—This paper presents the findings of a collaborative study of these two methods applied in the analysis of six fabrics manufactured for experimental purposes and composed of all wool, wool and cotton, or wool and rayon blends. Statistical analysis of the assembled results of the four collaborators indicated that both methods are accurate enough and precise enough to be useful, and that for routine test-

ing two or three samples are probably sufficient for the sulfuric acid method and from three to five for the aluminum chloride method. The results obtained by the sulfuric acid method were generally higher, but it is considered preferable, since it is more convenient and less time consuming.

Research to increase the use of cotton—a symposium. [U. S. D. A.] (*Jour. Home Econ.*, 32 (1940), No. 7, pp. 443-454).—The following papers are presented: Cotton Fabric Research in the Bureau of Home Economics, by R. O'Brien; (pp. 443-447); Domestic Utilization of Cotton in Relation to Economic Conditions in the South, by R. J. Cheatham (pp. 447-451); and The Importance of Chemical Finishing in Increasing the Consumption of Cotton Textiles, by W. M. Scott (pp. 451-454).

A critical study of some factors affecting the breaking strength and elongation of cotton yarns, H. F. SCHIEFER and R. S. CLEVELAND (*Jour. Res. Natl. Bur. Standards [U. S.]*, 27 (1941), No. 3, pp. 325-342, figs. 6).—"The results of single-strand tests to determine the breaking strength and elongation of cotton yarns varying in yarn number and spun with four twist multipliers are reported. Pendulum and inclined-plane types of testing machines and two rates of loading were used in the tests. The results give information regarding the corrections of these machines, variability of the yarns, and the number of tests required for a given precision and probability. The effect of rate of loading on the breaking strength and elongation is discussed. The tests on the inclined-plane machine yielded a significantly higher breaking strength and lower elongation than the tests on the pendulum machine. These unexpected differences are not attributable to a difference in the rates of loading between the two machines. They are explainable on the basis of the mechanics of the two types of machines."

Physical properties of women's full-fashioned hosiery knit from commercial cotton yarns, M. B. HAYS, E. C. PETERSEN, and D. A. TAYLOR. (U. S. D. A.). (*Jour. Home Econ.*, 32 (1940), No. 7, pp. 467-474, fig. 1).—This study is summarized by the authors as follows:

"The 43 styles of especially designed hose analyzed in this study are in weights that are suitable for outdoor work, active and spectator sports, and street wear. The appearance of these hose is decidedly better than the usual circular-knit cotton hose, since all styles are full-fashioned and are knit from combed, mercerized, gassed yarns in attractive colors.

"In lieu of serviceability studies, bursting strength and the test for elastic properties of hose are the best indicators of wearing quality. Bursting strength is found to depend on yarn number, gage, and pattern stitch. Hose with stretch tops, when evaluated by the load required to stretch hose from 19.2 to 20.2 in. circumference (s'-s), are more easily stretched than are the hose knit from the same yarn with a plain top. The reduced distortion and bagginess with a stretch top would give greater satisfaction in use. As measured by bursting strength and the hosiery test for elastic properties, the hose designed by the Bureau of Home Economics are equal or better than the 2 styles of full-fashioned hose purchased on the retail counter.

"This study shows that suitable cotton hose can be made in attractive colors with acceptable color permanence, that the stretch welt reduces the bagginess, and that certain designs will reduce the mottled effect often apparent in cotton hose and still have a reasonably high bursting strength."

Clothing for school-age boys, girls, A. BOWIE (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 10, pp. 1, 8).—This brief analysis of 256 clothing inventories of grammar school and high school boys and girls in a fair sample of rural families in various representative areas in Mississippi is concerned with articles

of outer clothing (excluding gifts) owned by the majority of the members of the four school-age groups. The data, showing number and percentage having each garment, the average cost per garment, and the average number owned per person, indicate that on the whole all four groups were tastefully and economically dressed, and that if there was an apparent inadequacy in clothing supplies it was perhaps in a lack of warm and waterproof clothing, particularly for grammar school boys and girls.

HOME MANAGEMENT AND EQUIPMENT

A handbook of home decoration, W. R. and H. A. STOREY (*Pelham, N. Y.: Bridgman Pub., [1941], pp. 208, [figs. 71]*).—Basic ideas of decoration—good design, harmonious color, effective texture, and unity of one decorative detail with another—are considered, together with the more practical matters of use, economy, and durability. Selection of furniture, room arrangement, color, walls, floors and rugs, fabrics, decorative accessories, curtains and slip covers, period styles, and economy in decorating are given consideration.

MISCELLANEOUS

The rise of the United States Department of Agriculture, T. S. HARDING. (U. S. D. A.). (*Sci. Mo., 53 (1941), No. 6, pp. 554-564*).—A historical sketch of the background, initiation, and development of the Department of Agriculture to its modern streamlined form which "has made it an invaluable agency in operating the National Defense Program, for it has ready at hand the organization and the machinery to do effectively many tasks which were neglected or were undertaken hastily in emergency set-ups during the World War."

1941 Supplement to laws applicable to the United States Department of Agriculture, J. K. KNUDSON (*U. S. Dept. Agr., 1941, pp. VI+664*).—This supplement to the 1935 edition (E. S. R., 75, p. 735) embraces statutes of a permanent character, reorganization plans, and Executive orders affecting the Department of Agriculture which were not included in the 1935 edition or which have been enacted or issued between September 6, 1935, and January 13, 1941.

List of bulletins of the agricultural experiment stations for the calendar years 1939 and 1940, C. E. PENNINGTON (*U. S. Dept. Agr., Misc. Pub. 459 (1941), pp. 86*).—This list, arranged by States and containing author and subject indexes, supplements that previously noted (E. S. R., 82, p. 859).

Sixtieth Annual Report of the New York State Agricultural Experiment Station, [1941], P. J. PARROTT (*New York State Sta. Rpt. 1941, pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Mississippi Farm Research, [October–November 1941] (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), Nos. 10, pp. 8, figs. 10; 11, pp. 8, figs. 2*).—In addition to articles noted previously or elsewhere in this issue, No. 10 contains Coordination of Agricultural Work Effectuated Through New School of Agriculture (pp. 1, 8); and Dairymen Have Major Interest in Program To Increase Oat Crop, by J. S. Moore (p. 2); No. 11, Plant Diseases—Nature, Cause, Control, by J. A. Pinckard, Jr. (pp. 1, 2); Preventing Growth of Horns on Cattle, by W. C. Cowsert (pp. 1, 2); Feeding the Suckling Pigs, by P. G. Bedenbaugh (p. 1); Grades of Feeder Calves on Mississippi Rations, by A. E. Cullison (pp. 1-2); Control of Insect Pests (p. 3); Livestock Feeding and Management (p. 4); Prices Plague Vegetable Growers (p. 4); and Poultry Production for Home or Market (p. 6).

NOTES

Arkansas University and Station.—The resignations are noted of Dr. L. M. Humphrey, professor of agronomy; H. M. Laude, assistant professor of agronomy; Dr. N. W. Hilston, instructor and assistant in animal industry; F. H. Vogel, instructor and assistant forester; and C. R. Pinckley, scientific assistant at the Fruit and Truck Branch Station. Arlon G. Hazen, instructor in agricultural engineering and assistant agricultural engineer, has been granted leave of absence for military service. Recent appointments include D. Boyd Shank as assistant professor of agronomy and agronomist, J. O. Dockins and Lawrence O. Fine as instructors in agronomy and assistant agronomists, Lorin E. Harris as instructor and assistant in animal industry, and Stewart Rowe, H. C. Anshutz, and Amos Underwood as scientific assistants in the Cotton, Livestock and Forestry, and Fruit and Truck Branch Stations, respectively.

Colorado College and Station.—Dr. Lindsey A. Brown, associate station agronomist in charge of soil surveys, has been granted a year's leave of absence to become special consultant in soils with the U. S. D. A. Farm Security Administration at Denver. His work has been taken over by Dale S. Romine, instructor and assistant in soils. Max E. Tyler has been appointed assistant bacteriologist, and Leroy Van Horn, assistant in wool technology.

Delaware University and Station.—Dean and Director Charles A. McCue, associated with the institution from 1907 until his retirement in 1939, died January 12 in his sixty-third year. He was a native of Michigan and a graduate of the Michigan College in 1901 and instructor in horticulture and assistant horticulturist there from 1904 to 1907. He had also served with the U. S. D. A. Forest Service. In Delaware he headed the horticultural work until 1920 and subsequently was director of the station, director of extension, and dean of the School of Agriculture. All these branches of the university developed steadily under his administration. His horticultural research was extensive and dealt especially with pomology and the role of plant food elements in orchard fruits. He served as president of the American Society for Horticultural Science in 1918. He had also been active in the Association of Land-Grant Colleges and Universities, serving as secretary in 1927 and as editor of its proceedings from 1928 to 1936.

Georgia Station.—A fireproof brick barn for seed storage has been completed. This building includes cotton and peanut breeding laboratories, a ginning room, storage space for 400 tons of grain, individual storerooms, and complete cleaning and treating equipment for grain.

S. R. Cecil has been appointed assistant food technologist in the department of food processing, succeeding I. T. Olsen, resigned to take up graduate work at the Massachusetts Institute of Technology.

Purdue University and Indiana Station.—James Troop, connected with the institution for more than 57 years and widely known as a pioneer horticulturist and entomologist, died at Urbana, Ill., on October 14, 1941, at the age of 88 years. A native of New York, Prof. Troop was graduated from the

Michigan College in 1878 and received the M. S. degree there in 1882. He came to Purdue in 1884 as head of the department of horticulture and entomology and in addition taught forestry, botany, and veterinary science. In 1912 the department was divided, but he continued as head of the department of entomology until 1920, when he became professor emeritus. He was also the first State entomologist of Indiana and in charge of its regulatory work from 1899 to 1907.

Kansas College and Station.—Wilmer E. Davis, associated with the botanical work of the institution since 1909 and professor of plant physiology since 1927, died January 17, aged 75 years. Born in Ohio in 1867, he was graduated from the University of Illinois in 1903. In addition to his instruction work he had given much attention to studies of seed germination.

Kentucky Station.—Recent appointments include Drs. Ladd N. Loomis and Woodrow Wilson Matthews as assistant veterinarians, Wilson Lowry Wright as instructor and assistant in animal husbandry, and William Bailey Cherry as assistant in bacteriology.

Massachusetts College and Station.—Dr. Edward B. Holland, research professor of chemistry, retired on January 13 after nearly 50 years' continuous service in agricultural chemistry. In the words of a recent communication from the station, "Dr. Holland is recognized for his contributions to dairying as related to information especially pertinent to butterfat. His contributions in the field of fungicides are very extensive, especially where these pertain to perfections in the use of copper sulfate. During the latter period of his service he has been especially devoted to analytical refinements in the determination of trace elements in connection with plant and animal (including human) nutrition."

Merrill J. Mack, professor of dairying, died February 9, aged 39 years. He was a native of Pennsylvania, graduating from the Pennsylvania College in 1923 and receiving the M. S. degree from the University of Wisconsin in 1925. He came to the college in 1923. In addition to instruction he had worked especially on the utilization of cream and other dairy products, including the vitamin C content of fruit ice creams and dairy beverages.

Dr. Chester E. Cross has been appointed assistant research professor of cranberry culture.

Montana College and Station.—The resignations are noted of Donald R. McCormick as assistant in chemistry to accept a similar position with the Washington College; Dr. Alva M. Schlehuder as associate professor and associate in agronomy to become associate geneticist at the U. S. Sugar Plant Field Station at Meridian, Miss.; and Thomas D. Watkins, Jr., as instructor in animal industry to respond to Army Service. Dr. Vincent E. Iverson, associate professor of horticulture, has been granted indefinite leave of absence for Army Service, beginning January 22.

New York State Station.—Extensive investigations on the nutritive values of dehydrated vegetables have been begun in the chemistry division as part of a cooperative project of the U. S. D. A. Bureau of Home Economics and in which Cornell University, the University of Texas, and the University of California are also participating. "For the present, the work here will have to do chiefly with (1) determination of the losses of vitamins and other nutrients of vegetables during dehydration, (2) losses of vitamins during storage of dehydrated vegetables, and (3) the degree of scalding prior to dehydration required to insure maximum vitamin retention and development of a simple laboratory method to indicate when the proper degree of scalding has been attained. Consideration will also be given to varietal adaptability to dehydration when freshly harvested vegetables are available on the station farm."

North Carolina College and Station.—The college department of animal industry has been reorganized, and Dr. A. O. Shaw, associate professor of dairy husbandry at the Kansas College and Station, has been designated as its head. R. H. Ruffner has been given charge of teaching in animal industry; Earl H. Hostetler of the work dealing with swine, beef cattle, sheep, meats, and work stock; and Dr. C. D. Grinnells of the division of dairying and the animal disease research. A division of animal nutrition, physiology, and genetics is to be added.

Dr. Ralph W. Cummings, associate professor of soil technology in the Cornell University and Station, has been appointed head of the department of agronomy beginning February 1. Borden S. Chronister has been appointed assistant agronomist vice H. D. Morris, resigned, and will carry on soil fertility work with peanuts, cotton, soybeans, and other cash crops.

North Dakota College and Station.—In a reconstruction of its hog barn, the station has provided two warm-air ducts a foot apart under a concrete floor of half of the farrowing pens. Warmed air is driven through these ducts by means of a fan. Comparisons are being made of the development of litters with the heated and unheated floors.

D. L. Hume, administrative assistant to the dean of the School of Agriculture and director of the station, has been called to military service. James R. Dice, dairy husbandman, has been designated administrative assistant to the dean and director during his absence.

Ohio Station.—A fruit products laboratory building has been completed.

Dr. W. E. Krauss has been appointed chief of the dairy department, succeeding C. C. Hayden, who becomes associate, with Dr. W. E. Pouden as assistant. Other appointments include Dr. L. H. Snyder as associate in animal industry and Dr. David C. Rife and Lawrence E. Kunkle as assistant and part-time assistant in the same department. John A. Alger has been appointed assistant in horticulture vice Joshua Crouse, called for military service.

Oklahoma College and Station.—The station observed its fiftieth anniversary during the golden celebration of the college from December 13 to 15, 1941. Dr. Henry G. Knight, Chief of the U. S. D. A. Bureau of Agricultural Chemistry and Engineering and director of the station from 1918 to 1921, was one of the principal speakers, representing the research activities of the land-grant colleges and taking as his subjects Future Markets for Farm Products and Chemists and Engineers in Agriculture.

Walter A. Krienke has been appointed assistant professor of dairy manufacturing and J. H. Hetrick instructor and superintendent of the creamery. Herman Hinrichs has succeeded L. G. McLean, resigned, as instructor in horticulture.

Pennsylvania College and Station.—Dr. Max Kriss, associated with the Institute of Animal Nutrition since 1918 and in recent years professor of animal nutrition, died November 16, 1941, at the age of 47 years. A native of Russia, he came to this country in 1910 and received the B. S. degree from the college in 1918 and the M. S. degree in 1920 and the Ph. D. degree from Yale University in 1936. His work had dealt especially with the energy metabolism and ventilation requirements of domestic animals, the net energy values of feeding stuffs, and the influence of nutrient compounds, especially amino acids, on the heat production of animals. He was the author or coauthor of more than 50 papers dealing with animal nutrition.

Recent appointments include Dr. Newell A. Norton as assistant professor of forest products and Lydia Tarrant as assistant professor of nutrition extension.

Rhode Island Station.—Dr. T. E. Odland, head of the department of agronomy, has been given military leave of absence. Dr. Esther L. Batchelder has resigned as director of home economics to accept a position with the U. S. D. A. Bureau of Home Economics.

Washington College and Station.—Additional land, amounting to 240 acres, has been purchased for the Irrigation Branch Station at Prosser. The new tract is 2 miles north of the station and located on the Roza irrigation project. It will be used for experimental work on irrigated crops and irrigation methods and practices.

Dr. Enoch A. Bryan, in the words of a recent statement from the institution "long known as the guiding genius of the early-day expansion of the station and college," died November 6, 1941, at the age of 86 years. A native of Indiana, he went to Washington in 1893 as president of the college and director of the station and continued as station head until 1907 and as president until 1916. From 1917 to 1923 he was commissioner of education for the State of Idaho, returning to Washington in the latter year as research professor of economics and in 1929 retiring as president emeritus.

Dr. A. B. Caster has been appointed assistant chemist in the division of home economics. Dr. Stewart A. Fuller has succeeded Dr. Lyle G. Nicholson, resigned, as assistant veterinarian.

Wisconsin University and Station.—The department of animal husbandry has been reorganized to provide for divisions of meats and swine breeding and feeding. Dr. John M. Fargo and O. Burr Ross have been placed in charge of these divisions. Joseph Elfner has been appointed extension landscape specialist vice L. G. Holmes, resigned to enter commercial work. Norman S. Lundquist has been appointed instructor in dairy husbandry.

To meet the emergency caused by the withdrawal for war work of 60 W. P. A. employees engaged in laboratory and clerical assistance, an elective service has been organized for university students. Over 200 volunteers have been obtained for part-time work, and it is expected that others will be needed for the full success of the program.

Wyoming University and Station.—Dr. J. L. Morrill, vice president of Ohio State University, has been appointed president as of January 1. J. A. Gorman, assistant professor of animal production and assistant animal husbandman, has been called to military service. Dr. Wendell L. Bartholdi has been appointed assistant professor of agronomy and assistant agronomist.

New Journals.—*The Nyasaland Agricultural Quarterly Journal* is being published at Blantyre, Nyasaland, by the Nyasaland Tea Association, Ltd., replacing *The Nyasaland Tea Association Quarterly Journal*. The Agricultural Department of Nyasaland is cooperating in its publication, and the initial number contains an article by A. S. Richardson, Director of Agriculture, entitled *Wartime Agriculture in Nyasaland*.

The Land is being published quarterly at 1721 Eye Street, N. W., Washington, D. C., by Friends of the Land, "a nonprofit, nonpartisan society for the conservation of soil, rain, and man." The initial number contains numerous brief articles, among them *Soil Defense*, by Vice President Henry A. Wallace.

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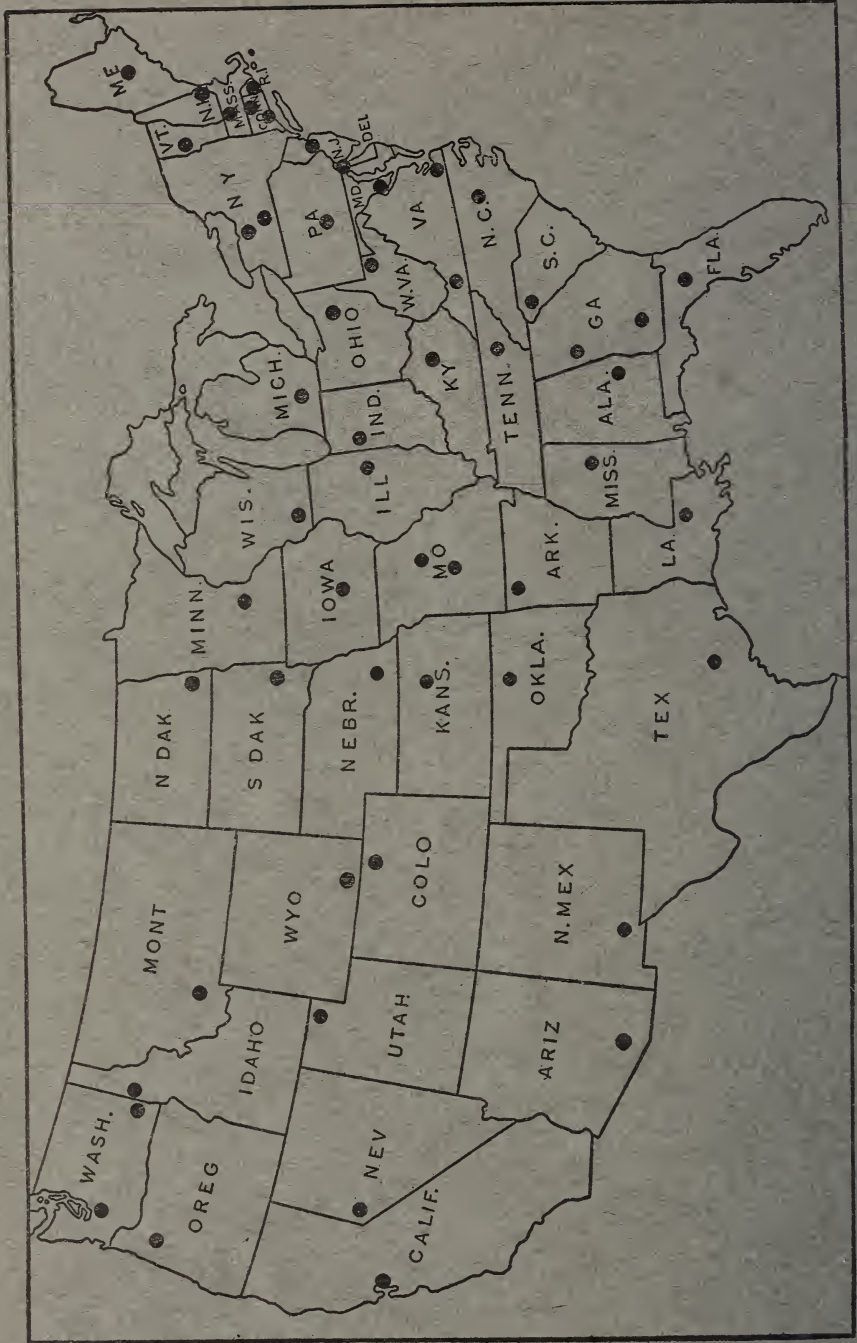
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EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

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ISABEL BEVIER, A PIONEER IN HOME ECONOMICS EDUCATION AND RESEARCH

In the words of a recent statement from the University of Illinois, the career of Dr. Isabel Bevier, who died in Urbana on March 17, 1942, "paralleled the rise of the profession of home economics." It might appropriately be added that for much of her 82 years she was a leader and active participant in that movement, and her contributions in the triple fields of collegiate instruction, extension, and research were timely and significant.

Born in Plymouth, Ohio, on November 17, 1860, she was graduated from the University of Wooster in 1885 and 2 years later received there the degree of master of philosophy in Latin and German. Her interests seem to have been primarily in science, however, for after some high school teaching and administration she became in 1888 professor of natural science in the Pennsylvania College for Women, leaving this position in 1897 for a brief service as professor of chemistry in Lake Erie College.

Characteristic of her development during this period was her continued study of chemistry at a wide range of institutions. Summers were spent at the Case School of Applied Science, Harvard University, and Wesleyan University, and there was a year at Western Reserve University and some time at the Massachusetts Institute of Technology devoted to the chemistry of foods. Of particular significance was her 1894 summer at Wesleyan University in the laboratory of Professor W. O. Atwater and under the immediate supervision of Drs. Charles D. Woods and C. F. Langworthy, all of whom became prominently identified with human nutrition studies. At that time the initial appropriation of \$10,000 had just been made by Congress for investigation and report by the Federal Department of Agriculture on "the nutritive value of the various articles and commodities used for human food." This inquiry had been assigned to the Office of Experiment Stations and delegated to Dr. Atwater. As one result of her contacts with him, Dr. Bevier was commissioned to carry on a series of dietary studies for the Office of families in different stations of life in Pittsburgh and about 5 years later of

a group of students in Lake Erie College. These studies were among the earliest of their kind in this country.

In 1900 she was appointed in charge of a new department in the University of Illinois which became known as the department of household science. At its creation, we are told, "not only was the department nameless, but there also was no precedent and no textbook for it." In making the appointment, President Andrew Sloan Draper announced that the department "will be judged by the results obtained in its laboratories and classrooms and its success by the measure of university respect obtained for it." The first class, with three members, was graduated in 1903. In 1918 there were 94 graduates. During the 21 years of her active administration as head of the department, more than 5,000 women were enrolled in its courses.

As would be expected from her scientific background and associations, Dr. Bevier was consistently interested in home economics research. Her initial work in Illinois dealt especially with methods of roasting beef, supplementing the extensive meat studies then under way at the university by Dr. H. S. Grindley of the department of animal husbandry. Among its concrete accomplishments was the progress made in standardization of the conditions of roasting through temperature control of the oven and the use of a clinical thermometer to determine the internal temperature of the meat and the end point of any desired doneness. She was also successful in securing in 1908 the appointment of a research assistant in home economics who is believed to have been the first full-time research worker in that subject in a land-grant institution.

Dr. Bevier also took a leading part in home economics extension, serving as vice director in Illinois from 1915 to 1921 and again as acting vice director from 1929 to 1930. Her leadership thus included both the pioneer days and the First World War period. During that war she was associated with the U. S. Food Administration and other groups as a home economics representative.

The period from 1921 to 1929 was largely spent in home economics work in the southern branch of the University of California and the University of Arizona, but she returned to Illinois in the latter year as professor of home economics. In 1930 she retired as professor emeritus.

In an evaluation of Dr. Bevier's work, special mention should be made of her influence upon others. Much of this was exerted personally and through two groups—the American Home Economics Association and the Association of Land-Grant Colleges and Universities. She was prominently identified with the formation of the Home Economics Association, serving as its second president, and with the early management and policies of its *Journal of Home Economics*.

Her standing in the Association of Land-Grant Colleges and Universities is indicated by her service in 1919 as chairman of the home economics division of the college section, and her designation in 1919 as the representative of home economics on the special committee for the reorganization of the association itself, which resulted in the establishment of a section of home economics coordinate with agriculture and engineering.

Still another sphere of influence was through her writings. In addition to many shorter bulletins and articles, these included the pioneer texts entitled *Home Economics Movement*, *Food and Nutrition*, and *Selection and Preservation of Food (Laboratory Manual)*, all brought out, with the assistance of others, in 1906 and 1907, and *The House—Plan, Decoration, and Care*, which appeared in the latter year. Most of these books were issued in several editions and were of much value in giving perspective to the new movement and bringing its pedagogic material into concrete form.

Dr. Bevier's work received much recognition, including the bestowal of honorary degrees of doctor of science by the Iowa State College in 1920 and the University of Wooster in 1936. Many appreciative tributes have also appeared, from which parts of two may be quoted. One of these, by Miss Lita Bane, a successor at the university, points out that "Miss Bevier stood out preeminently for her scholarly standards, being consistently unwilling to offer college courses devoted almost entirely to skills, unwilling to mortgage the student's time with specialized home economics subjects to the point where courses in economics, literature, and art were crowded out, and always standing for a liberal college course with a major only in home economics." The other by the late Dr. Lafayette B. Mendel, of Yale University, fittingly epitomizes her work in the statement that "Miss Bevier belonged to that important group of American women, trained in an atmosphere of science, who ventured to give direction to the new home economics movement in a modern, constructive way. She was one of the pioneers who endeavored to translate current scientific research into the language of everyday life. This called for courage in the face of traditional resistance to change, for vision and faith in what seemed to be unwarranted innovation, and for real leadership."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Fractionation of waxy and ordinary cornstarch, C. G. CALDWELL and R. M. HIXON. (Iowa State Col.). (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 11, pp. 2876-2880, figs. 2).—The ratio of soluble to insoluble components separated from ordinary cornstarch pastes by electro dialysis or by freezing was found to depend upon the extent of peptization. Retrogradation or aging of starch pastes was shown by the definite X-ray patterns to be a crystallization process. A comparison of the physical properties of the limit dextrins obtained from waxy and ordinary cornstarch by digestion with β -amylase indicated rather a close similarity than a chemical difference between them. Somewhat similar quantities of dimethyl glucose were obtained by hydrolysis of methylated cornstarch (0.93 percent) and of the methylated limit dextrin (0.67 percent). If branching exists in the original starch, such linkages are hydrolyzed by the β -amylase.

The comparative baking qualities of starches prepared from different wheat varieties, R. H. HARRIS and L. D. SIBBITT. (N. Dak. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 5, pp. 585-604, figs. 8).—The starch of each variety to be tested was washed out in dilute sodium phosphate buffer solution, permitted to settle, separated, and dried at from 90° to 94° F., after which it was mixed with a suitable quantity of dried gluten, sugar sufficiently in excess of that used in ordinary doughs to compensate the loss of the water-soluble carbohydrates in the flour, and the remainder of the usual dough components. The percentage of gluten in the mixture had a predominant influence upon the loaf volume, but distinct differences in baking quality among the starches from five varieties of hard red spring wheat are shown in the external appearances, cross sections, and volumes of the baked loaves.

Comparative baking quality of wheat starches, R. H. HARRIS and L. D. SIBBITT (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 2, pp. 2-6, figs. 4).—This is condensed from the paper noted above.

The constitution of arabo-galactan.—I, The components and position of linkage, E. V. WHITE. (Univ. Idaho). (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 11, pp. 2871-2875).—The reproducibility of "arabo-galactan," a water-soluble gum present in larch wood, *Larix occidentalis*, was demonstrated by conversion to the fully acetylated derivative followed, after purification, by saponification to the original compound. The methyl ether of arabo-galactan upon treatment with methyl-alcoholic hydrogen chloride yielded the glycosides of 2,4-dimethyl-*d*-galactose, 2,3,4-trimethyl-*d*-galactose, 2,3,4,6-tetramethyl-*d*-galactose, and 2,3,5-trimethyl-*l*-arabinose, showing that both 1-3 and 1-6 oxygen linkages are present in the parent compound and that a substantial proportion of the galactose units are linked at both the 3 and 6 positions. A branched chain structure, terminated by residues of galactopyranose and arabofuranose, is indicated.

The preparation of Δ^8 , Δ^8 ⁽¹⁴⁾- and Δ^{14} -cholestenes, J. C. ECK and E. W. HOLLINGSWORTH. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 11, pp. 2986-2990).— Δ^8 , Δ^8 ⁽¹⁴⁾- and Δ^{14} -cholestenes were prepared and the struc-

ture of Δ^8 -cholestene was established by its conversion to cholestan-7-one. The normal hydrogenation and the consumption of bromine and of perbenzoic acid by cholestenes were compared. The specific rotations of Δ^8 -, $\Delta^{8(14)}$ - and Δ^{14} -cholestenes were found to be in agreement with the specific rotations of the analogous Δ^8 -, Δ^8 (14)- and Δ^{14} -unsaturated steroid derivatives, respectively (δ -, α - and β -stenols, respectively).

The structure of "7-dehydrocholestene isomer," J. C. ECK and E. W. HOLLINGSWORTH. (Iowa Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 1, pp. 107-111).—The product obtained by the action of quinoline on 5,6-dibromocholestane is indicated to be an inseparable mixture of $\Delta^{4,6}$ -cholestadiene and coprostene. 7-Dehydrocholestene isomer is indicated to be $\Delta^{4,6}$ -cholestadiene. The Wolff-Kishner reduction product of the semicarbazone of $\Delta^{4,6}$ -cholestadiene-3 is indicated to be an inseparable mixture containing $\Delta^{4,6}$ -cholestadiene. The specific rotation of $\Delta^{4,6}$ -cholestadiene is $+4.27^\circ$. An additional double bond in the 3,4-position in cholestene or in the 6,7-position in coprostene effects a marked increase in levorotation. $\Delta^{4,6}$ -cholestadiene was found to be rearranged to $\Delta^{3,5}$ -cholestadiene by treatment with dry hydrogen chloride in chloroform.

Methyl esters of the higher fatty acids, F. W. WYMAN and C. BARKENBUS. (Univ. Ky.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 11, pp. 658-661, figs. 5).—The methyl esters of caprylic, capric, lauric, myristic, palmitic, and stearic acids were purified and their refractive indices determined. Small quantities of known mixtures of these esters were fractionally distilled through a spinning-band column and their composition was determined. With the exception of the more volatile esters, the determinations are held to be fairly accurate considering the difficulty connected with separating such mixtures. In oil analyses where only small quantities of these acids are available, this method offers the first convenient and fairly accurate method of analysis.

The isolation of p-aminobenzoic acid from yeast, K. C. BLANCHARD (*Jour. Biol. Chem.*, 140 (1941), No. 3, pp. 919-926).—p-Aminobenzoic acid was obtained from a commercial aqueous alcohol extract of yeast by alcohol-ether extraction, followed by purification of the extract, through congelation of some insoluble material of apparent lipide nature and defecation with basic lead acetate and subsequent extraction with ether. The ether extract, after purification, treatment with water, and evaporation at a low temperature not exceeding 35° [C.], yielded crystals of the product which were purified by recrystallization from hot water. The p-aminobenzoic acid was also obtained from yeast by a modified procedure involving the formation of the slightly soluble acetyl derivative, which was extracted with an alcohol-ether mixture. Recovery was made from this solution through a series of purification steps ending with sedimentation of the p-acetylamino benzoic acid from an ether extract adjusted to pH 3.8. A yield of 2.1 mg. was obtained from 600 gm. of plasmolyzed and heated yeast, while 3.7 mg. was obtained from a like quantity of autolyzed yeast. This increase in yield upon autolysis suggested that yeast contains a free and a combined form of the p-aminobenzoic acid. Identity of all crystalline products obtained was established by mixed melting point determinations.

The molecular constitution of an insoluble polysaccharide from yeast, Saccharomyces cerevisiae, W. Z. HASSID, M. A. JOSLYN, and R. M. MCCREADY. (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 1, pp. 295-298, fig. 1).—The low specific rotations of the acetylated and methylated derivatives and the upward mutarotation during hydrolysis suggested that the glucosidic linkages of the anhydroglucose units are predominantly of the β -type. On methylation and subsequent hydrolysis of the polysaccharide 2,4,6-trimethylglucose was obtained as the sole product of hydrolysis. No end-group (tetramethylglucose)

could be detected, a possible indication that the molecule is probably of the closed chain type. The molecular weight of the polysaccharide determined by the Staudinger viscosity method was approximately 6,500.

The preparation of coenzyme I from yeast, S. WILLIAMSON and D. E. GREEN (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 345-346).—A hot water extract of yeast is defecated with basic lead acetate, the clear filtrate is adjusted to pH 6.5 with 10 percent acetic acid, and the coenzyme is precipitated with silver nitrate. The washed precipitate, suspended in water, is decomposed with hydrogen sulfide, and following filtration and aeration to remove silver and hydrogen sulfides, the enzyme is precipitated by pouring the aqueous solution into 5 volumes of acetone in the cold and permitting to stand 2 hr. The product obtained by this method was estimated to be about 63-68 percent pure, as judged by spectrophotometric and total phosphorus determinations.

Stability of prothrombin in the presence of thrombin, J. H. FERGUSON (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 80-83, fig. 1).—Evidence is presented to indicate that "thrombin and (citrated) prothrombin can co-exist with no more destruction of either than can readily be attributed to the natural instability of both preparations," and that "thrombin itself is neither an activator nor a destroyer of prothrombin."

Protein-digesting enzymes of papaya and pineapple, A. K. BALLS (*U. S. Dept. Agr. Cir.* 631 (1941), pp. 9, figs. 3).—The preparation and present uses of papain and the possible uses of bromelin are discussed. A method of obtaining bromelin from pineapple juice, expressed from the peelings and cores of the fruit, without losing the value of the sugar is suggested. The enzyme may be precipitated by the addition of alcohol to the third press juice, not particularly valuable to the canner, leaving the sugar in solution. The use of papain in tenderizing meat and the possible use of bromelin are discussed. A method developed by the Department for the manufacture of a cleaner and more active preparation of commercial papain than that ordinarily sold today has at least doubled the yield of enzyme from a papaya tree by preventing the loss of enzyme that takes place in the present process of manufacture. Methods for preparing two proteolytic enzymes in the crystalline form from crude papain have also been developed. These preparations are too expensive for ordinary use, but they may be of service in medicine.

The nature of the liberation of bound barley amylase as affected by salt solutions, M. F. DULL and R. G. SWANSON (*Cereal Chem.*, 18 (1941), No. 1, pp. 113-120).—Experimental evidence indicates that the bound amylase of barley, as released by salt solutions, is released as a result of the peptization of the proteins to which the enzyme is thought to be adsorbed or bound.

The effect of wheat type, protein content, and malting conditions on the properties of malted wheat flour, W. F. GEDDES, F. C. HILDEBRAND, and J. A. ANDERSON. (Minn. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 1, pp. 42-60).—Growth and yield of malt were not affected by wheat type or protein content. Increasing the steeping level and germination time resulted in greater growth and lower yield. Raising the kilning temperature decreased yield slightly. Protein content of malted wheats and of flours experimentally milled therefrom decreased with conditions which tended to increase growth, the effect being greater for flours. In general, decrease in ash was not significant. Amylase activity was influenced by all factors investigated except kilning. Increase in germination time and steeping level and the use of hard red spring wheat rather than durum raised amylase activity. The highest activity was obtained with high-protein hard red spring wheat steeped to 44 percent moisture and germinated 5 days. Autolytic protease activity of the malted wheat flour

was increased with longer germination, higher steeping level, higher protein, and with durum wheat. The effect of steeping was conditioned by protein level and germination time, and the last two factors were influenced by steeping level. Amylase and protease activity were significantly correlated ($r = +0.676$). The ratio between these activities was markedly influenced by wheat type, protein content, steeping level, and germination time. At constant amylase activity, the lowest protease activity was obtained with low-protein hard red spring wheat steeped to 40 percent moisture and germinated 5 days. The results of baking tests were little affected by the variations studied.

The application of the dropping mercury electrode to the study of oxidation-reduction systems in flour, H. A. LATTINEN and B. SULLIVAN (*Cereal Chem.*, 18 (1941), No. 1, pp. 60-73, figs. 14).—A substance giving an anodic wave (indicating a reducing substance) was released from the gluten on treatment with sodium hydroxide but not from the starch. A variety of other treatments failed to liberate the substance. A buffered solution containing the alkali-treated wet gluten gave a positive test for mercury on electrolysis, indicating formation of a mercury complex. Certain RSH compounds give similar mercury complexes. The group giving that anodic wave may be some reduced sulfur linkage.

Chemical composition of *Symphoricarpos rotundifolius* as influenced by soil, site, and date of collection, L. A. STODDART. (Utah Expt. Sta.) (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 12, pp. 727-739, fig. 1).—*S. rotundifolius*, or round-leaf snowberry, was selected to represent the forage plants of the area under investigation (near Logan) as being palatable, abundant, and rather uniformly distributed over all soil types.

Date of collection was by far the most influential factor, late-season sampling resulting in a highly significant decrease in protein, nitrogen-free extract, total ash, phosphorus, and magnesium, and a highly significant quadratic influence upon calcium. Only crude fat failed to respond to season. Soil type had a highly significant influence upon total ash and phosphorus content and a pronounced though insignificant effect upon protein content. Site had a significant influence upon protein and a highly significant influence upon magnesium, protein being higher and magnesium lower on good sites. Nitrogen-free extract was also significantly higher on poor sites. Complex interactions between date of collection, site, and soil were often observed. Attention had, therefore, to be given to all before broad conclusions were drawn regarding the influence of any. Large error or variation was apparent in the analytical procedure for crude fat, and the field variability was especially high in crude fiber, nitrogen-free extract, and crude fat. For the determination of most components duplicate collection and duplicate analysis did not increase the accuracy to a degree commensurate with the extra expense incurred.

The dimorphism of sulfathiazole, D. C. GROVE and G. L. KEENAN (*Jour. Amer. Chem. Soc.* 63 (1941), No. 1, pp. 97-99, figs. 3).—Sulfathiazole (2-sulfanilamidothiazone) exists in dimorphic forms. Methods of preparation, melting points, optical properties, and photomicrographs are presented.

Portable low-pressure gas tanks, G. R. ROBERTSON. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 11, p. 686, fig. 1).—The author gives specifications for a tank designed for pressures of 200 lb. or less, height from 35 to 40 in. and diameter 12 in., the tank having wheels which clear the floor by about $\frac{1}{8}$ in. when the tank stands vertically, and a handle for tipping the tank onto its wheels and rolling it about. The device was found more convenient than those now on the market and was especially useful for combustion oxygen, for nitrogen used to provide an inert atmosphere, etc.

Preparing asbestos for filtering mats, B. L. KASPIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 9, p. 517, fig. 1).—A wide-mouthed, square glass jar of about 2-qt. capacity is covered by a piece of moderately heavy cloth (ordinary laboratory towel material is suitable). A glass tube passes through a small hole in the cloth and is held in position by two tightly fitting rubber stoppers, one placed above and the other below the cloth. The tube should be placed near one corner of the jar and extend approximately halfway to the bottom. The outer end of the tube is connected to a compressed air line. Cut the asbestos to roughly 0.5-in. lengths, place a 0.25-in. layer of this material in the bottom of the jar, securely fasten the cloth cover, and gradually admit the compressed air. When the correct rate of flow is attained, the asbestos is lifted by the air currents and swirled violently. In about 5 min. the asbestos becomes fluffy and half fills the jar. If the air is admitted too rapidly the asbestos tends to rise and accumulate at the top of the jar. The apparatus should be used in a hood with a strong draft, since its operation produces a fine asbestos dust that is extremely irritating.

Micro determination of some constituents of plant ash, M. E. WALL. (N. J. Expt. Stas.). (*Plant Physiol.*, 15 (1940), No. 3, pp. 537-545).—The author describes micro methods found satisfactory for preparation of plant samples for mineral analyses, colorimetric determinations of phosphate, magnesium, potassium, sodium, and calcium, and gives data on the accuracy of the methods.

Preparation of Nessler's reagent, A. P. VANSELOW. (Calif. Citrus Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 9, pp. 516-517, fig. 1).—Nessler's reagent prepared according to formulas found in textbooks and papers may show slowness in the development of color, formation of a red precipitate, and the development of off colors, especially with low concentration of ammonia. From a study of the phase-rule diagram for this solution and from experimental investigation, the author concludes that a reagent should have 10 moles of potassium hydroxide for each equivalent of mercuric ion in solution with 5 percent excess of potassium iodide over and above that called for by the hypothetical compound potassium mercuric iodide. It should stand several days before being used to permit any precipitate to settle out. There is no necessity of using involved methods of preparation. The author recommends that 45.5 gm. of mercuric iodide and 34.9 gm. of potassium iodide be dissolved in as little water as is needed, 112 gm. of potassium hydroxide (140 cc. of a solution, sp. gr. $\frac{15^\circ}{4^\circ}=1.538$) added, and the whole diluted to 1 l.

This solution is 0.2 N with respect to the mercury content. In the Nessler test, 5 cc. of this reagent to 100 cc. of final volume are used, and the color comparisons with the standards are made 30 min. after mixing. Nessler's reagent prepared according to this formula has been used for several years with completely satisfactory results.

Notes on the colorimetric determination of traces of cobalt, I. A. BLACK (*Soil Sci.*, 51 (1941), No. 5, pp. 387-390, fig. 1).—The quantitative colorimetric estimation of traces of cobalt by α -nitroso- β -naphthol appears possible provided acidity is controlled and the color of excess reagent is destroyed by treatment with sulfite. Color comparisons are valid even between solutions with considerably different cobalt contents. Iron can be removed without difficulty and without impairing the accuracy of the method. The use of sulfite for eliminating the color of the reagent appears to be a new procedure.

A rapid method for the microanalysis of lead, L. T. FAIRHALL and R. G. KEENAN (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 11, pp. 3076-3079, fig. 1).—A rapid and precise evaluation of minute amounts of lead in drinking water and

in urine without the necessity of ashing involves extraction with dithizone, extraction from the chloroform layer with 2 percent nitric acid, precipitation as chromate, and iodometric titration of the chromate after solution in hydrochloric acid.

Colorimetric determination of phosphate, S. R. DICKMAN and R. H. BRAY. (Ill. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 11, pp. 665-668).—The authors describe a colorimetric method for phosphates which employs a molybdate-hydrochloric acid solution instead of a molybdate sulfuric acid solution. The results are not affected by chlorides or by the ferric ion up to 15 p. p. m. Fading is less rapid than in most methods. The method is applicable for phosphate determinations in soil fusions, hydrochloric acid extracts of soils, water analyses, oceanographic analyses, plant oxidations in which the sample is taken up in hydrochloric acid, and biological determinations.

Detection and estimation of dihydrorotenone in the hydrogenation products of rotenone, L. D. GOODHUE and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 11, pp. 652-654, fig. 1).—To develop a method for the determination of dihydrorotenone in the mixture of hydrogenation products, some of the physical and chemical properties of these compounds were examined. A combination of physical properties gave some information as to the amount of dihydrorotenone present, but a better method is based on the observation that this is the only reduction product giving an appreciable red color by the Goodhue test (E. S. R., 76, p. 154).

Physicochemical assay of vitamin A, N. D. EMBREE (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 3, pp. 144-145).—It is pointed out that low results are often obtained in the assay of low-potency fish-liver oils, food products, and certain pharmaceutical preparations when the determination of vitamin A is carried out by measurement of the absorption of ultraviolet light (1) at the maximum (328 $m\mu$) of the vitamin A absorption band of an alcohol solution of the material or purified extract or (2) at the maximum (620 $m\mu$) of the absorption band of the blue-colored reaction product formed by mixing a chloroform solution of the material with 10 times its volume of a saturated cholorform solution of antimony trichloride. The poor results are generally attributed to the instability of vitamin A in dilute solution. To show that this instability is due to destruction of vitamin A by ultraviolet light, solutions of vitamin A containing from 20 to 25 U. S. P. units per cubic centimeter were divided into two portions. One portion was placed in an amber glass test tube and the other in a clear glass test tube, the tightly stoppered tubes then being exposed to daylight of cloudy days for a period of from 4 to 5 hr. on a bench 12 ft. from the window. Samples exposed in the clear glass tubes showed losses of vitamin A potency varying from 8 to 55 percent, whereas those stored in the amber glass showed little or no loss. Because of this destruction of vitamin A in dilute solutions exposed to light, it is suggested that laboratories performing assays for vitamin A in food, medicinal, and physiological preparations should have certain types of amber glassware, concerning which suggestions are made.

Spectrophotometric determination of vitamin A: Critical study of applicability to fish liver oils, D. T. EWING, J. M. VANDENBELT, A. D. EMMETT, and O. D. BIRD. (Mich. State Col. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 11, pp. 639-644).—The Bausch and Lomb spectrophotometer and the Hilger vitameter used in a long series of determinations on seven fish-liver oils having a wide range in vitamin A potency gave reproducible results with good agreement between determinations by the two instruments. The following fundamentals of procedure were established:

The test reading should be made within 1 hr. after preparation of the solution for which either isopropyl or absolute ethyl alcohol may be used, since

the vitamin shows equal absorption in the two mediums. Cells should be carefully paired and kept scrupulously clean. A Hilger hydrogen tube, because of its constancy as a source of light, is preferable to a condensed spark, although the latter may be used if its position with respect to the optical axis can be maintained with precision. For visual comparison, optimum results are obtained if the photographic emulsion has been processed to a density of 0.6. Unsaturated long-chain fatty acids, particularly in low-potency oils, and metallic salts of fatty acids, such as copper olate and ferric olate, are interfering substances. The former may be removed by saponification and the latter eliminated through insolubility in isopropyl alcohol.

Analyses of the data showed that the mean of as few as two determinations gave a satisfactory result (± 2 percent) with the spectrophotometer, but that a minimum of six tests was required to establish a satisfactory $E_{1\text{cm}}^{1\%}$ value with the vitameter. Conversion factors calculated by correlating the spectrophotometer and vitameter data with those from biological procedure were in good agreement, the mean value for converting the $E_{1\text{cm}}^{1\%}$ value to International Units per gram being 2,137.

Spectrophotometric assay of vitamin A, with special reference to margarine, J. R. EDISBURY (*Analyst*, 65 (1940), No. 774, pp. 484-492, figs. 3).—The application of spectrophotometric methods to the assay of vitamin A in margarines and the concentrates used in their vitaminization is described briefly with reference to apparatus, solvents and reagent, and examination of sample. Consideration is also given to limitations to estimation of potency, such as inhibitive and enhancement effects and irrelevant absorption, and to the interpretation of data.

Spectrographic characteristics of vitamin A materials, R. L. MACFARLAN, P. K. BATES, and E. C. MERRILL (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 11, pp. 645-647, figs. 4).—A study was made of the ultraviolet absorption of vitamin A as determined with a Littrow spectrograph having a Hilger Spekker ultraviolet photometer mounted in front of it and Hilger type J absorption cells for liquids (1 cm. in thickness) mounted in the photometer. A condensed spark between tungsten steel electrodes, accurately aligned through mounting on a de Gramont sparking stand, was used as a light source. Line intensities were read by means of a Zeiss spectrum line photometer. With this apparatus, permitting great accuracy of detail, the results obtained led to the following conclusions:

“There appears to be a continuous change in absorption of the U. S. P. reference cod-liver oil with use in the laboratory over an extended period of time, and as a standard for spectrographic measurements more rigid limitations are necessary than are now in use for biological assay. Fresh U. S. P. reference cod-liver oil gives good agreement with the absorption value published by other experimenters. Care must be exercised in using the spectrographic method to evaluate commercial cod-liver oils and concentrates because of the variability of the extraneous absorption. The distilled vitamin A esters show negligible change in their absorption properties upon saponification. Within experimental error the absorption curve shapes of the distilled vitamin A esters and the unsaponifiable fraction of the fresh U. S. P. reference oil are identical. Beer's law appears to hold over the wave-length range 3,100 to 3,500 a. u. of the vitamin A absorption curve.”

Extraction of carotene from plant material: A rapid quantitative method, L. A. MOORE and R. ELY. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 600-601, fig. 1).—Extraction is accomplished with 200 cc. of a foaming solvent consisting of a mixture of petroleum ether (43 percent

by volume) and 95 percent ethyl alcohol (57 percent by volume) preheated to 27° C. and added to from 1 to 4 gm. of the sample placed in the container of a food blender equipped with knives turned by a high-speed motor. The blender is run for 5 min., the solvent is removed from the residue, and sufficient water is added to dilute the alcohol to about 80 percent, thus permitting separation of the alcohol and petroleum ether phases. The residue and the alcohol are washed with petroleum ether. The combined petroleum ether extracts are washed with water to remove alcohol and then passed through a column of dicalcium phosphate to remove pigments other than carotene. The filtrate is made up to volume, and carotene concentration is evaluated with a photoelectric colorimeter. The method, recommended because of its rapidity and the consequent reduction of enzyme activity in fresh material, gives results in good agreement with those obtained by a previously published method (E. S. R., 85, p. 583) in which the sample is ground in a mortar with sand and refluxed for 1 hr. with alcohol. Values by both methods are reported for several hays, silages, and fresh green materials, including carrot root, dock and dandelion leaves, and leaves of a number of legumes and grasses.

The assay of vitamin B₁ (*Ontario Res. Found. Bul.*, 8 (1941), No. 3, pp. 5-9, figs. 4).—A review which briefly outlines the general principles involved in the various biological and biochemical assay methods of determining thiamin.

Riboflavin determination by the microbiological method, A. ARNOLD, S. T. LIPSUS, and D. J. GREENE (*Food Res.*, 6 (1941), No. 1, pp. 39-43).—The microbiological method of Snell and Strong (E. S. R., 82, p. 587) applied to extracts of natural and concentrated source materials was found to give fully satisfactory results as judged by (1) agreement of determinations at three significant levels, (2) agreement between separate samples, and (3) agreement with reported analyses of similar materials by the same method or by biological technics. Brewers' yeast, a fuller's earth adsorbate from rice bran concentrate with added whey adsorbate, a liver extract, a rice bran, and a processed rice bran averaged, respectively, 45.3 γ , 81.3 γ , 312.0 γ , 4.0 γ , and 2.85 γ of riboflavin per gram. Two samples of dried skim milk averaged 15.9 γ and 16.6 γ per gram.

A method for the determination in vitro of riboflavin in tissues, F. O. VAN DUYN (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 207-218, figs. 2).—A number of existing in-vitro methods for determination of riboflavin in tissues were investigated and found unsatisfactory either because the riboflavin was not quantitatively extracted or because of the simultaneous extraction of substances interfering in the subsequent estimation of fluorescence. A new method was, therefore, developed and tested. The procedure, described in some detail, involved hydrolysis of the tissue (ground with sand) by incubation at 37° C. for 20 hr. with 0.3 percent pepsin and 0.2 percent HCl; extraction with water by boiling the above mixture and filtering; and determination of the intensity of fluorescence of the extract as measured by the use of the Klett fluorimeter, an instrument of the two-celled, balanced-circuit type so designed that the fluorescence of the unknown solution is measured in terms of the reference standard.

The results obtained by this method were compared with those obtained by bio-assay of the same tissues. The tissues investigated represented liver, kidney, heart muscle, and skeletal muscle of rats reared on different diets and contained, respectively, 4.0 γ , 5.1 γ , 15.0 γ , and 23.0 γ of riboflavin per gram. The feeding method employed was a modification of the Bourquin-Sherman quantitative determination of vitamin G, the response of the test animals being interpreted from a reference curve of response established for animals fed varying amounts (0 γ -12 γ six times a week) of riboflavin for 4 weeks. The method as developed for the extraction of riboflavin and its subsequent measurements in vitro was

found to be quantitative, although further modification was indicated for successful application to the determination of riboflavin in skeletal muscle. The feeding method used and the in-vitro method finally developed gave values that were without significant difference.

A microbiological assay technique for pantothenic acid with the use of *Proteus morganii*, M. J. PELCZAR, JR., and J. R. PORTER (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 111-119, fig. 1).—The microbiological technic described involves the use of *P. morganii*, which responds to a smaller dose of pantothenic acid than any other organism hitherto reported. In the presence of as little as 0.0002 μ g. of synthetic calcium pantothenate per cubic centimeter of the assay medium visible growth occurs, thus making it possible to determine the pantothenic acid content of the material to be tested in such dilution that non-specific factors will not interfere with the reaction. The preparation of the inoculum, the basal medium, and the assay medium is described in detail, and the results are reported of the response of the organism to graded quantities of pure solutions of calcium pantothenate, the assay of extracts of natural substances, and the recovery of added calcium pantothenate from several substrates.

Microbiological assay for pantothenic acid, F. M. STRONG, R. E. FEENEY, and A. EARLE. (Wis. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 8, pp. 566-570, figs. 2).—The method is based upon the fact that *Lactobacillus casei* ϵ (= *L. helveticus*), which requires riboflavin (E. S. R., 82, p. 587), also requires pantothenic acid. With a basal medium complete for this organism except for pantothenic acid, the addition of crude suspensions of samples containing the acid stimulates fermentation. The amount of lactic acid produced, as determined by direct titration of the entire culture, is a measure of the pantothenic acid in the sample. In the method described as to cultures and inoculum, basal medium and procedure, assays of the sample under test are run at three levels estimated to fall within the range 0.03-0.12 μ g. of calcium pantothenate, and the titration results are compared with those from a standard curve established with pure *d*-calcium pantothenate. The pantothenate content of the sample calculated from the various levels must agree within at least 20 percent. The values for the three levels are averaged for the final results. Analyses of a number of products indicate that liver, yeast, kidney, egg yolk, dried whey, dried buttermilk, sweetpotato, and the bran of grains are all good sources; whole grains are much lower; and molasses is variable.

The reliability of the method is supported by agreement of the assay results at different levels, recovery of added pantothenic acid, absence of disturbing effects from other growth-promoting substances, comparison with results of chick assay on the same samples, and specificity of structure required for activity. The method is applicable to a wide range of materials, requires no expensive or unusual apparatus, and permits a single worker to assay about 15 samples per day.

Polarographic determination of ascorbic acid, M. M. KIRK. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 625-626, fig. 1).—This preliminary study of vitamin C, determined with a Fisher Elecdropode or polarograph, employed solutions of pure vitamin C in various buffers, of which 2 percent metaphosphoric acid was found to be the most satisfactory. The solution of the vitamin in the buffer was placed under the dropping mercury electrode and deaerated by bubbling nitrogen through it for 15 min. The determination was then carried out with the nitrogen streaming across the surface of the solution, and with the mercury dropping at the rate of 1 drop every 3-6 sec.

Curves obtained with the dropping mercury electrode polarized as the anode or as the cathode are presented and discussed. The results obtained indicated that the method could be adapted for accurate quantitative analysis by comparing the curves obtained with an unknown solution with calibration curves. The determination would be specific, sensitive to small amounts of ascorbic acid, and not hindered by the presence of pigments.

Chemical methods for the determination of clinical vitamin C (ascorbic acid) deficiency, G. J. KASTLIN, C. G. KING, C. R. SCHLESINGER, and J. W. MITCHELL (*Amer. Jour. Clin. Pathol.*, 10 (1940), No. 12, pp. 882-893).—The method adopted by the authors for evaluating the state of nutrition with respect to vitamin C consists in "(1) determining the fasting blood plasma level and urinary excretion, followed by (2) intravenous injection of 500 mg. of ascorbic acid, and (3) subsequent determination of the blood plasma value at 5 min. and both blood plasma and urinary excretion values after 1, 2, 3, and 4 hr." The typical normal blood saturation curve is characterized by a fasting level of 0.7 mg. of ascorbic acid per 100 cc. or higher, a relatively high (4.5-9 mg. percent) 5-min. level, and a gradual decrease to a point at 4 hr. still distinctly above the fasting level; the urinary excretion is highest in the first hour and amounts to 40 percent or more of the test dose during the 4-hr. period. The typical severe deficiency blood curve is characterized by a fasting level below 0.4 mg. per 100 cc. and only a slight and variable rise at 5 min., followed by a rapid fall to near the fasting level; the total urinary excretion ranges from a few milligrams to 20 percent of the test dose. The first responses to treatment of vitamin C deficiency are an increase in the 5-min. peak level and a decrease in the rate of fall of the blood concentration, together with an increase in total urinary excretion, these changes occurring before there is an appreciable rise in the fasting blood level.

Interpretation of the curves should be based on all factors of the test considered in connection with the dietary history and clinical condition. It is noted, however, that "the extreme instability of vitamin C in most foodstuffs may readily lead to deficiencies on dietary regimes that on paper appear to be adequate."

Estimation of vitamin D in margarine, N. T. GRIDGEMAN, H. LEES, and H. WILKINSON (*Analyst*, 65 (1940), No. 774, pp. 493-495).—It is pointed out that proposed chemical tests are inapplicable because of the low potency of margarines and the interference by other substances such as sterols, vitamin A, and carotenoids. Notes on the application of the line-test and bone-ash methods, as used by the authors for a number of years, are given, together with a brief discussion of their accuracy. Margarines of the potency of 1.0 International Unit of vitamin D per gram were assayed satisfactorily by the line-test method. Assays of vitamin concentrates and of margarines enriched with them showed that the margarine assay was not falsified by the feeding of fat to the test animals, except when necessarily large amounts were fed in the assay of very low-potency margarines. The more sensitive bone-ash method gave somewhat different results from the line-test method, possibly because the international standard was not so effective in the line-test as in the bone-ash assay.

Modified technique for prothrombin determination in blood, H. S. and R. W. HOLMBOE (*Jour. Lab. and Clin. Med.*, 26 (1940), No. 2, pp. 408-415, figs. 2).—The method described was developed after preliminary investigation of thromboplastin preparations from dried brain tissue from the rat, guinea pig, rabbit, sheep, and man, and after preliminary experiments showing the effect of varying the concentrations of thromboplastin, plasma, and calcium chloride. The method, based on that of Quick, employs 0.2 cc. of plasma from oxalated whole

blood (1 part 0.1 M sodium oxalate in 10 parts of oxalated blood), 0.2 cc. of thromboplastin solution representing an ether-soluble, acetone-insoluble extract of dried sheep brain diluted 1:5 with normal saline at the time of use, and 0.2 cc. of eightieth-molar calcium chloride solution. The mixture of plasma and thromboplastin solution in a serological tube is incubated at 37° C. for 7 min., and the calcium chloride then added immediately and mixed by shaking the tube, which is slanted and rotated at 15-sec. intervals. The interval between the addition of calcium chloride and clot formation, as measured by stop watch, constitutes the prothrombin time. The method applied to test samples of blood from 250 consecutive patients gave a range of prothrombin times from 55 to 85 sec., 92 percent of these cases coming within the range of from 60 to 80 sec. and averaging 70 sec.

Utilization of California fruits, W. V. CRUESS and G. L. MARSH (*California Sta. Cir. 349 (1941), pp. 53, figs. 11*).—This circular includes a brief general discussion of the present disposal of California fruits and considers such specific uses as unfermented beverages, fruit sirups for table use, fruit candies, pectin, bases for jellies and jams, frozen pack, fruits in ice creams and ices, dried-fruit products, fruits in cereal products, fruit sauces, sieved fruits or fruit purées, breakfast fruits, coffee substitutes, vinegar, pickled and spiced fruits, fruit wines, and fruit brandies. The value of fruits in the diet and the utilization of byproducts are also considered.

Methods and equipment for the sun-drying of fruits, E. M. MRAK and J. D. LONG (*California Sta. Cir. 350 (1941), pp. 69, figs. 26*).—This circular takes up fruits for drying, equipment (discussed in considerable detail), methods of preparation and drying, handling fruit after drying, farm-scale packing of dried fruits, storage and treatment of packed dried fruits, and routine analyses of dried fruits.

AGRICULTURAL METEOROLOGY

Dynamic meteorology, B. HAURWITZ (*New York and London: McGraw-Hill Book Co., 1941, pp. X+365, figs. 89*).—The great recent progress in this field has been largely due to the application of the laws of thermodynamics and hydrodynamics to the study of the atmosphere and its motions. "It is the aim of this book to give an account of these investigations and their results, with regard to applications to weather forecasting and to research."

Bibliographic tools for meteorological research, R. W. BURHOE (*Amer. Met. Soc. Bul., 22 (1941), No. 9, pp. 357-361*).

La météorologie et l'agriculture [Meteorology and agriculture], L. BEAUGE (*Bonne Terre, 22 (1941), No. 5-6, pp. 129-146, pls. 4*).

Preliminary studies in seasonal weather forecasting, R. H. WEIGHTMAN (*Mo. Weather Rev. [U. S.] Sup. 45 (1941), pp. VIII+99, figs. 291*).—The purpose of this investigation, begun in 1931, was to make a preliminary survey, by means of simple correlation coefficients, of association between pressures at foreign stations and subsequent temperature and precipitation in the United States, with the idea that such a survey would point out the areas outside this country in which antecedent pressure conditions might be suggestive of time-lag relations with conditions in the United States. Though the study has produced no outstandingly large correlation coefficients, it is believed that this has been accomplished. The data are presented in 291 charts.

Atlas of climatic types in the United States, 1900-1939, C. W. THORNTON-WHITE (*U. S. Dept. Agr., Misc. Pub. 421 (1941), pp. II+7, pls. 48, figs. 7*).—Few parts of the United States are free from the drought hazard. Although drought and flood years cannot be predicted, it is possible by using the many records of

the U. S. Weather Bureau to determine the frequency with which climatic events are likely to occur, and such information is of great aid in evaluating the agricultural potentialities of a region and in land-use planning. In this contribution (by the Soil Conservation Service in cooperation with the Weather Bureau) the evolution of the climatic pattern, vegetation as a climatic indicator, determination of effective precipitation, climates of the United States, and climatic variation are discussed (135 references), and the maps present graphically the moisture factor of climate and show the normal position of the principal climatic types, their variation from year to year, and the frequency of occurrence of the various individual climates. From a study of these maps, an appreciation of the diversity of the problems of soil and water conservation in the different parts of the country may be obtained.

Special report on climatic conditions in the Dominican Republic, S. A. ROBIOU V. (*Ciudad Trujillo, Dominican Republic: Met. Serv., 1941, pp. 8, fig. 1; Span., pp. 5-8*).

The uniform climate of Malaya as a barrier to plant migration, R. E. HOLTUM (*6. Pacific Sci. Cong., Calif., 1939, Proc., vol. 4, pp. 669-671*).—The author concludes that the climatic conditions are such as to form a barrier to the spontaneous dispersal of many plants adapted to a seasonal climate and needing the stimulus of a dry season to make them flower or a regular resting period in the rhythm of their vegetative and reproductive functions.

Growth rings and climate, W. S. GLOCK (*Bot. Rev., 7 (1941), No. 12, pp. 649-713*).—This monographic review (203 references) considers growth factors and their complexity, insects, cross-dating, statistical correlation, smoothing, cycles, samples as representative of growth increment, factors at a particular site, growth layers and annual increments, temperature correspondence, rainfall interval to which growth corresponds, correspondence of tree growth with rainfall, climatic changes and forest migration, growth patterns, and assumptions forming the groundwork for interpretation. It is concluded that "the derivation of climate from tree growth should be sought, apparently, by other means than by direct quantitative attempts to base amount of rainfall on width of growth layers although at times this, in a measure, can be done. Without doubt, 'the methods of an ecologically minded botanist' applied to tree growth through physiological function and its dependent anatomical response should supplant the more simple, the more obvious but less fruitful and less valid methods of direct correlations. An understanding of plant physiology and anatomy brought about by judicious experimentation under the strict discipline of the botanist may ultimately reveal the criteria by which growth layers and their cellular structure will yield a picture of the soil-moisture régime and perhaps thereby indirectly a picture of rainfall type."

Mittelwellige UV.—Strahlung als Klimafaktor für Hochgebirgspflanzen [Ultraviolet radiation of medium wavelength as a climatic factor for alpine plants], K. PIRSCHLE (*Naturwissenschaften, 29 (1941), No. 11, pp. 165-166*).—A brief review of work by the author and others.

Some effects of cold on plants in Alabama in 1940, R. M. HARPER (*Torreyia, 41 (1941), No. 5, pp. 166-169*).

Surface runoff determination from rainfall without using coefficients (*Amer. Soc. Civ. Engin. Proc., 67 (1941), Nos. 4, pt. 1, pp. 533-568, figs. 14; 6, pp. 1180-1182; 8, pt. 1, pp. 1469-1489, fig. 1; 10, pp. 1925-1932, figs. 5*).—In the main paper (pp. 533-568) W. W. Horner and S. W. Jens call attention to the recent improvement in hydrologic data with respect to precipitation and stream flow, and to the information with respect to infiltration developed from research by the U. S. Department of Agriculture. They outline a method of applying this

information for evaluating surface run-off from precipitation data without use of a coefficient which they deem generally applicable to all drainage basins and is as detailed as would be used in urban storm drainage.

Discussions of the paper follow by L. L. Harrold (pp. 1180-1182), C. E. Ramser, L. K. Sherman, A. J. Schafmayer, C. S. Jarvis, G. W. Musgrave, and F. L. Flint (pp. 1469-1488), and W. I. Hicks (pp. 1925-1932).

A study of excessive rainfall, H. D. DYCK and W. A. MATTICE (*Mo. Weather Rev.* [U. S.], 69 (1941), No. 10, pp. 293-301, figs. 17).—For statistical purposes the Weather Bureau classifies excessive rainfall into four groups, two for short-period storms giving the minimum rate of fall in terms of minutes for a group of southern States as distinguished from the rest of the United States and the other two being established at 1 in. in 1 hr. and 2.5 in. in 24 hr. Yarnell has covered excessive rains for short periods (*E. S. R.*, 74, p. 7). The two longer periods are taken up here, in a general way supplementing and extending Yarnell's material.

Torrential rains as a serious handicap in the South, S. S. VISHNER (*Geog. Rev.*, 31 (1941), No. 4, pp. 644-652, figs. 2).—Recently available evidence that soil erosion is especially serious in the southern United States invites attention to its climatic basis. Towards this end the present paper discusses, in addition to the general question, a special study of 24-hr. rains of more than 10 in., the causes of regional contrasts, and some effects of big rains.

Rainfall conditions as a southern handicap, S. S. VISHNER (*Jour. Geog.*, 40 (1941), No. 8, pp. 302-306).—The author discusses the undesirable seasonal distribution of rainfall, heavy cool season rainfall, thundershowers, and 24-hr. rains in excess of 10 in.

Mountain floods and vegetation, R. W. BAILEY (*6. Pacific Sci. Cong., Calif., 1939 Proc.*, vol. 4, pp. 731-736).—A general discussion is presented of the destructiveness of mountain floods to vegetation, the factors involved in the process, and control methods that may be employed, with examples in the Colorado-Utah-Arizona area. A geological-ecological approach in the analysis of floods is suggested as a useful procedure for both engineers and plant men who are charged with the responsibility of coping with flood problems. "While the record of gradational processes may not always be readily apparent, this approach should prove helpful wherever circumstances permit."

The rainfall of Martinique, J. E. FAIRCHILD (*Amer. Met. Soc. Bul.*, 22 (1941), No. 6, pp. 249-255, figs. 8).

Monthly Weather Review, [September-October 1941] (*Mo. Weather Rev.* [U. S.], 69 (1941), Nos. 9, pp. 257-291, pls. 11, figs. 9; 10, pp. 293-327, pls. 10, figs. 20).—In addition to meteorological, climatological, solar radiation, and sunspot data, these numbers contain an article noted above and the following contributions of agricultural interest:

No. 9.—Automatic Dust Sampling and Analyzing Instruments for Atmospheric Pollution Surveys, by W. F. Davidson and W. Master (pp. 257-260); and Tropical Disturbances of September 1941, by H. C. Sumner (pp. 264-266).

No. 10.—Hurricane of October 3-12 and Tropical Disturbance of October 18-21, 1941 [in the Bahama Islands-Florida Area], by H. C. Sumner (pp. 303-304).

SOILS—FERTILIZERS

[Soil investigations at the Alabama Station] (*Alabama Sta. Rpt. 1940*, pp. 16-17, 18-20, fig. 1).—The value of contour furrows for water conservation on pasture land is reported by J. H. Neal, A. W. Cooper, and E. L. Mayton; differences in run-off and soil losses from terrace outlets on strip-cropped and

on clean-cultivated areas, by E. G. Diseker; a comparison of crimson clover and hairy vetch as soil-conserving crops, by Neal and C. H. Bailey; the limitation of soil tests for available potassium in soils, by N. J. Volk; a survey of the agricultural lime resources in Alabama, by J. A. Naftel; and a comparison of the relative values of superphosphate, rock phosphate, and colloidal phosphate for crop production, and the effect of ammonium sulfate on the availability of rock phosphate for crop production, both by G. W. Volk.

[Soil investigations of the Colorado Station] (*Colorado Sta. Rpt. 1941, pp. 11, 21-22*).—Progress on the following investigations is reported: Optimum nutrient balance in soils, availability of mineral nutrients, effects of irrigation water on soil, and methods of isolation and the distribution of the soil micro-organism *Azotobacter vinelandii* in Colorado.

[Soil Survey Reports, 1936 and 1937 Series] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1936, No. 9, pp. 59, figs. 2, map 1; 1937, No. 4, pp. 57, figs. 3, map 1*).—These surveys were made in cooperation with the Iowa Experiment Station and the University of Georgia, respectively: 1936, No. 9, Story County, Iowa, H. R. Meldrum et al.; and 1937, No. 4, Catoosa County, Ga., A. E. Taylor et al.

Distribution of carbon in morphological units from the B horizons of Solonetz-like soils, J. L. RETZER and R. W. SIMONSON. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 33 (1941), No. 11, pp. 1009-1013, figs. 3*).—Results of investigations on the distribution of carbon within morphological units (columns) from the B horizons of Solonetzlike soils from California and Nevada are presented. The highest contents of carbon were found in the outermost layer on the faces of the columns, and the lowest amounts were found either in the core or the light-gray cap of the unit.

The influence of tree roots on soil morphology, H. J. LUTZ and F. S. GRISWOLD (*Amer. Jour. Sci., 237 (1939), No. 6, pp. 389-400, pl. 1, figs. 4*).—The authors point out that tree roots may cause profound and diverse disturbances which may account for many of the morphological characteristics of soil profiles developed under forest stands.

The laws of soil colloidal behavior.—XXIII, The constitution of the pedosphere and soil classification, S. MATTSON (*Soil Sci., 51 (1941), No. 5, pp. 407-425, figs. 4*).—In the twenty-third contribution of this series (E. S. R., 84, p. 155), the author proposes viewing the soil, its parts, and activities in accordance with a biological analogy in which the body as a whole is compared with the pedosphere, the anatomy with the great soil groups, the morphology with the soil type as based on profile characteristics, the histology with the textural units, the protoplasm with the colloidal complex, and the physiology with the soil solution. A classification is based on nine groups (humus content and base status), types and series (profile characteristics), varieties (texture), colloid-chemical factors (composition, amphoteric, and colloidal behavior of colloids), and physiological factors (pH and KPN status). The term "pedosphere," as above used, is so defined as to include the mineral, aqueous, atmospheric, and biological materials of the soil, which "alternate as dispersed phase and dispersion medium."

The soil-forming processes in relation to anionic and cationic solvation and eluviation are discussed.

A pressure-membrane extraction apparatus for soil solution, L. A. RICHARDS. (U. S. D. A.). (*Soil Sci., 51 (1941), No. 5, pp. 377-386, figs. 3*).—In a modified form of suction apparatus, a carefully supported Cellophane membrane serves as the bottom of a gas-pressure chamber in which soils are placed for solution extraction. In this way the moisture content of soil in contact with

the membrane will be reduced by the amount that would be necessary under normal atmospheric conditions to make the pressure deficiency of the soil water equal to the excess gas pressure in the extration chamber. In each of 3 soils an extraction pressure of 16 atmospheres reduced the moisture content of from 5- to 10-mm. layers of soil from saturation to below the wilting point in from 24 to 36 hr. The apparatus can be used for obtaining sorption curves and studying the permeability of unsaturated porous media over a considerably extended range of negative pressure.

A simple apparatus for measuring noncapillary porosity on an extensive scale, R. W. LEAMER and B. SHAW. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 11, pp. 1003-1008, fig. 1).—A simple, inexpensive apparatus for measuring "noncapillary" porosity on a large number of soil samples is described. The pressure-deficiency method of removing water from a saturated sample is the basis of the apparatus. The equipment accommodates 30 3-in. core samples, but the authors point out that there is no limit to the number that may be used.

Field percolation rates of four Wisconsin soils having different drainage characteristics, L. B. NELSON and R. J. MUCKENHIRN. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 11, pp. 1028-1036, figs. 2).—Percolation rates as determined by a buffer-compartment method are given for undisturbed soil profiles of two poorly drained and two well-drained Wisconsin soils. Data on laboratory percolation rates, total porosities, volume weights, and maximum water-holding capacities are presented for soil cores taken from the different horizons of each of the four soils.

Effect of crops and slopes on rates of run-off and total soil loss, J. H. LILLARD. (Va. Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 11, pp. 396-398, 406, figs. 9).—Run-off rates and amounts from corn, wheat, and hay crops grown on five different slopes on Dunmore silt loam are presented by means of hydrographs and maximum intensity curves. The author points out the difficulty of attempting to assign to any one factor its quantitative effect on the erosion process for any specific condition because these effects are constantly changing as a result of their interrelation with other factors. It is concluded, however, that a close-growing crop, such as wheat, will prevent excessive rates of run-off from Dunmore silt loam on slopes of 5, 10, 15, 20, and 25 percent under Virginia rainfall conditions. High rates of run-off are to be expected from corn grown on this soil, and serious losses will result when corn is planted on slopes above 10 percent.

The four-electrode resistance method for measuring soil-moisture content under field conditions, N. E. EDLEFSEN and A. B. C. ANDERSON. (Calif. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 5, pp. 367-376, figs. 6).—In order to eliminate the effect upon the results of the highly erratic contact resistance between electrode and soil, the four-electrode method was used in measuring the electrical resistance of the soil as a function of moisture content. Such measurements were made both in a Sudan grass and in a sugar beet plat. Tinned iron electrodes were found to be more sturdy and convenient than carbon and proved to be entirely satisfactory. A comparison of the resistances at the same moisture content before and after irrigation indicates that the variations in resistances due to factors other than moisture, under the conditions of this experiment, are not great in the top 4 ft. of soil.

There was no sudden increase in the electrical resistance of the soil as the plant continued to remove water in the vicinity of the permanent wilting percentage. When the electrical resistances of a soil supporting a crop are plotted as a function of moisture content, a curve is obtained showing a rapid

increase in resistance with decreasing moisture content in the neighborhood of the permanent wilting percentage. This curve appears to be asymptotic to the moisture content corresponding to the permanent wilting percentage.

The availameter and its use in soil moisture control.—II, Calibration methods, R. B. ALLYN and R. A. WORK. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 51 (1941), No. 5, pp. 391-406, figs. 7).—Soil stability measurements made by means of an instrument described in the preceding paper (E. S. R., 85, p. 732) of this series were compared with oven-dry soil-moisture determinations over a wide range both of soils and of moisture content. The correlation curves thus obtained can be converted into terms of available soil moisture by the use of soil-moisture constants. A good correlation between availameter soil-stability readings and available soil moisture is shown even where soil-moisture constants varied somewhat from location to location in small areas. A method whereby an approximate calibration may be quickly obtained from limited local data is also presented.

Comparisons of soil moisture as determined by oven-drying and by the availameter showed close agreement. The difference was less than 2 percent of the available soil-moisture capacity in the great majority of cases on heavy clay soil. Comparisons in terms of total moisture content showed differences of less than 0.5 percent in most cases. Very little time additional to that required to obtain the field samples alone is needed to complete the moisture determinations by the availameter method. The complete operation can be made directly in the field without technical skill or laboratory equipment.

Método tonométrico simple para la determinación indirecta del coeficiente de marchitez del suelo [A simple indirect method for determining the wilting coefficient of soils based on tonometric equilibrium], A. ARENA (*Rev. Argentina Agron.*, 8 (1941), No. 3, pp. 220-234, figs. 6; *Eng. abs.*, pp. 232-233).—The technic is described in detail. The author recommends the method because it is inexpensive and simple and allows for several determinations.

Erodibility investigations on some soils of the upper Gila watershed, J. E. FLETCHER and E. L. BEUTNER. (Coop. Ariz. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 794 (1941), pp. 32, figs. 14).—From the data collected in the Department's surveys of the upper Gila watershed of Arizona and New Mexico, curves have been made by plotting mean percent erosion against slope. From these curves erodibility has been defined and a numerical value, erodibility integral, has been employed to express it. An analysis of these erodibility-integral values indicated that soil erodibility varies with the parent rock. In the southern Gray Desert soils, the order from the erodible to the nonerodible soil-producing parent rock is (1) limestone, (2) mixed origin, (3) granite, (4) rhyolite and basalt, and (5) quartzite; and in the southern Brown soils, (1) granite, (2) rhyolite, and (3) quartzite, limestone, and basalt. The data also indicated that erodibility varies with size of rock particles, rocky soils proving more erodible than gravelly soils within any one soil type. Erodiability increases as the texture within a series becomes coarser. The characteristics of four soils of the upper Gila watershed are described in some detail following fairly complete analyses.

Effect of mulching materials on moisture loss from soils, L. M. TURK and N. L. PARTRIDGE. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 59-62).—Shallow-lysimeter data are presented. Although the relative amount of water collected during four periods varied somewhat between the different series, the lysimeters with no mulch and those with peat mulch gave small amounts of drainage water, and the lysimeters under other mulching materials (gravel, sawdust, shavings, straw, alfalfa hay, and stover) gave considerably

larger quantities of percolate during the same time. These more effective materials differed only slightly, and their effectiveness in water conservation appeared to be in the order in which they are listed, gravel most effective and stover least.

The Missouri soil saving dam: Low-cost structure for use in farm plans for water management, J. C. WOOLEY, W. M. CLARK, and R. P. BEASLEY (*Missouri Sta. Bul.* 434 (1941), pp. 23, fig. 11).—The dam is constructed on a slope between 1.25:1 and 1.5:1, and thus utilizes the angle of repose of the soil to avoid the necessity of heavy construction. The cut-off wings are also constructed on a slope extending back into the berm, allowing the earth to lie on the sloping wing and avoiding, to a large degree, the tendency of earth to pull away from the structures in dry weather, as from a vertical wall structure. Effects of shrinkage or freezing of the soil are minimized. The new structure is not anchored deeply in the ground, where its parts would be subjected to different conditions and thus to varying stresses. The structure also consists of a combination of arches, avoiding excessive stress encountered in straight-wall and corner construction. Wood forms, except for the velocity check, are not needed. Earth forms are produced by cutting or building. The reinforcing mesh is pulled or blocked up 2 in. above the earth, and concrete is floated (by means of a wood float) to a uniform thickness of 4 in. When it begins to set it is worked with a steel trowel to leave a dense weather-resistant finish. Working drawings are included. The proper use and placement of such dams are discussed.

Early American soil conservationists, A. McDONALD (*U. S. Dept. Agr., Misc. Pub.* 449 (1941), pp. [1]+63, pl. 1, figs. 8).—This is a historical review of the work and writings of Jared Eliot, Samuel Deane, Solomon Drown, John Taylor, John Lorain, Isaac Hill, Nicholas Sorsby, and Edmund Ruffin. These outstanding conservationists directed the farmers' attention to the dangers of erosion in this country and correctly analyzed its social, economic, and physical causes. Methods of control in relation to slope, soil type, and climatic differences were worked out for various parts of the country. The early conservationists also brought out the danger of exploiting the land by growing cash crops and of the importance of Government cooperation in bringing about soil conservation.

Nonsymbiotic nitrogen fixation in soils of a semi-arid region of north China, R. T. MOYER (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 11, pp. 980-992).—A soil from a semiarid region of north China was investigated to determine the extent of nitrogen addition through nonsymbiotic nitrogen fixation. The total nitrogen content of a soil over a period of years of cropping determined from small artificial crops showed that the soil underwent a marked loss of nitrogen, and the amount lost was approximately the same as the nitrogen removed in the harvested crops. Soil was placed in large pots sunk in the ground in an attempt to measure the amount of nitrogen added to the soil by fixation. In one of the experiments it was not found possible to account for the loss of nitrogen which occurred. In no case was there found to be a gain in nitrogen from fixation. In comparing Honeoye silt loam and Dunkirk silty clay loam with the China soil, it was found that a greater number of macroscopic colonies of *Azotobacter* appeared on the former soils but that nitrogen was fixed at a more rapid rate by the China soil. The author concludes that the amount of nitrogen added by nonsymbiotic fixation is not sufficient to provide a very great part of that required by the growing crop.

Studies on nitrate and ammonia in soils under permanent pasture.—I, The stabilization of nitrate in soil samples, E. B. DAVIES, M. R. COUP, F. B.

THOMPSON, and R. P. HANSEN (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 6A, pp. 348A-351A).—The value of toluene and of cooling as means of stabilizing nitrate in soil samples has been determined. Three drops of toluene per 500 gm. of soil was found to be sufficiently effective. A slight decrease in nitrate was apparent at the end of 2 days, but by the end of a week a rising tendency was found. Larger amounts of toluene reduced the concentration of nitrate in soils. Cooling below the freezing point failed to prevent nitrification in 0- to 1-in. samples but was effective in 1- to 3-in. samples.

The behavior of soluble organic phosphates added to soils, L. A. PINCK, M. S. SHERMAN, and F. E. ALLISON. (U. S. D. A.). (*Soil Sci.*, 51 (1941), No. 5, pp. 351-365, figs. 4).—In general, the phosphorus in sodium glycerophosphate, calcium hexosediphosphate, sodium nucleate, dipotassium phenyl phosphate, and disodium ethyl phosphate was retained rapidly by Cecil clay loam and usually by Las Vegas loam, whereas retention by Norfolk sandy loam was not so rapid or so complete. The phosphorus in potassium diphenyl phosphate and in potassium diphenyl pyrophosphate usually remained water-soluble for a considerably longer period. The un-ionized triethyl and trimethyl phosphates could be completely recovered from two of the three soils after 3 weeks. Phosphorus supplied as calcium diethyl phosphate tended to remain in the water-soluble form for several days, and might possibly have some advantages over inorganic phosphates from the standpoint of penetration. Some of the organic phosphates, such as glycerophosphate, were retained by heavy soils so tenaciously and so quickly after addition as to indicate that colloidal action rather than micro-organisms must have been the primary process.

Comparative availabilities of organic and inorganic phosphates as shown by the Neubauer method, F. E. ALLISON, L. A. PINCK, and M. S. SHERMAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 10, pp. 918-926, fig. 1).—The availability or toxicity of several organic and inorganic phosphate materials is reported. The organic carriers included glycerophosphate, hexosediphosphate, nucleic acid and its sodium salt, monophenyl and diphenyl orthophosphates, diphenyl pyrophosphate, and monoethyl, diethyl, and triethyl phosphates, while the inorganic phosphates used for comparative purposes were mono-, di-, and tricalcium phosphates, hydroxyapatite, calcined phosphate, and sodium metaphosphate. All of the organic phosphates, with the exception of triethyl phosphate, showed availabilities similar to those of the common inorganic phosphates. Triethyl phosphate, which does not hydrolyze in aqueous solution, showed a negligible availability as a plant nutrient. The phenyl phosphates, particularly the monophenyl phosphate, were toxic in the lighter soils and at the higher concentration.

The authors point out that the results as a whole emphasize the importance of the soil itself in determining the ability of plants to utilize added organic and inorganic phosphates. The results noted above are reviewed to bring out the fact that organic phosphates are fairly rapidly converted into inorganic phosphates, thus making their behavior in plant-nutrition studies not markedly different from that in inorganic phosphates. With both the organic and inorganic phosphates a high colloidal or clay content, especially if iron and aluminum oxides are abundant, leads to marked phosphate fixation.

Arsenic in natural phosphates and phosphate fertilizers, T. H. TREMEARNE and K. D. JACOB (*U. S. Dept. Agr., Tech. Bul.* 781 (1941), pp. 40).—Of 162 samples of various types and grades of domestic mineral phosphates the content of acid-soluble arsenic ranged from 0.4 p. p. m. in a Florida soft phosphate to 188.2 p. p. m. in an Arkansas phosphate. The average results were in the descending order, South Carolina river rock 68.4 p. p. m., Arkansas 61, Mon-

tana 47.6, Tennessee blue rock 20.4, Utah 17.8, Oklahoma 17.6, South Carolina land rock 17.1, Tennessee brown rock and phosphatic limestone 14.6, Idaho 12.6, Wyoming 12.1, Florida land pebble 11.9, Tennessee white rock 10.6, Kentucky 9.9, Florida waste pond 9, Florida soft 7.5, Virginia fluorapatite 5.5, and Florida hard rock 5.4 p. p. m. The results for arsenic in 48 samples of mineral phosphates from Africa, Canada, Europe, South Australia, and various islands ranged from 5.1 p. p. m. in calcium phosphate from Nauru Islands to 76.2 p. p. m. in aluminum iron phosphate from Daito Islands.

It is shown that arsenic occurred in phosphate rock principally, if not entirely, in the acid-soluble condition, and that the presence of fluorine compounds in the rock caused serious error in its determination unless arsenic-free glassware is used for the acid digestion.

"There is, in general, no orderly relationship between the arsenic content and the geologic age of phosphate rock or between the arsenic content and the quantities of other constituents (phosphorus, iron, sulfide sulfur, organic carbon, or nitrogen). . . . There is evidence that phosphates from primary deposits tend to contain somewhat more arsenic than do those from secondary deposits. The arsenic content of mineral phosphates is similar, in general, to that of marls, domestic shales, carbonate minerals, coals, and silicate rocks and minerals; usually it is higher than that of soils, clays, sediments, and nitrate and halide minerals, but is much lower than that of oxide minerals, greensand, glauconite, and especially sulfide materials."

The results for arsenic in 30 samples of ordinary and double superphosphates, made from Florida, Tennessee, Idaho, and Montana phosphate rocks, ranged from 2.2 p. p. m. in an ordinary superphosphate made with sulfuric acid obtained as a byproduct of a zinc-smelting operation to 1,199.1 p. p. m. in an ordinary superphosphate made with a mixed acid produced from domestic sulfur and Spanish pyrite. Ordinary superphosphates made with sulfuric acid produced entirely from domestic sulfur or obtained as a byproduct of a copper-smelting operation in Tennessee contained less than 15 p. m. of arsenic. In the double superphosphates (11 samples) the results for arsenic ranged from 11.1 p. p. m. in a material made from Tennessee brown-rock phosphate with phosphoric acid produced by the electric-furnace process to 404.6 p. p. m. in a material made from Idaho phosphate rock with phosphoric acid produced by the wet process, using sulfuric acid made from an iron sulfide concentrate.

"In proportion to their phosphorus contents, calcined, sintered, or nodulized phosphates usually contain notably less arsenic than do the parent phosphate rocks. Only a small portion of the arsenic in the parent phosphate rock is retained in defluorinated phosphate. . . .

"Arsenic was found in ammonium phosphate (5.5 to 74.2 p. p. m.), basic slag (2.1 to 11.2 p. p. m.), and bone ash and bonemeal (0.2 to 2.2 p. p. m.). Calcium metaphosphate, fossil bone and teeth, dicalcium phosphate, flue dust from a phosphoric acid blast furnace, Non-Acid phosphate, and Peruvian guano contained arsenic in quantities ranging from 2.6 in the first material to 24.9 p. p. m. in the last.

"When all the factors affecting the action of arsenic on plants and on soil organisms under practical conditions of farming are taken into consideration, it seems very unlikely that the quantities of arsenic contributed to the soil in phosphate fertilizers are sufficient to produce toxic effects even with very large annual applications of the fertilizer over extended periods of time."

A nutrient element slighted in agricultural research, F. J. ALWAY. (Minn. Expt. Sta.). (*Com. Fert.*, 62 (1941), No. 4, pp. 12-19).—An address setting forth the history of research on and the present status of knowledge of sulfur as a plant nutrient.

Available boron as affected by soil treatments, G. R. MUHR. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 220-226).—Calcium and magnesium carbonates applied to Warsaw sandy loam and Hillsdale sandy loam B horizon soil, both acid soils, reduced the boron content of soybean tissue. Sodium carbonate and sulfate did not alter the boron content of soybeans on these soils. Calcium and magnesium sulfates did not alter the boron content of the tissue of soybeans grown on the Hillsdale soil not treated with borax, but reduced the boron content of those grown in pots to which excessive borax had been applied. Accumulations of calcium and nitrogen accompanied an excessive boron content in the plant tissue. Active calcium, organic matter, and clay, which prevented applied borax from becoming toxic to soybeans, prevented boron from accumulating in the plant tissue. Yields were increased with applications of borax until the boron content of the dry plant tissue reached 30 p. p. m. Borax became toxic to soybeans when the boron content of the dry tissue reached from 50 to 60 p. p. m. The magnesium and iron contents of soybeans were not greatly altered by toxic quantities of borax. When sugar beets were grown in an alkaline soil, deficient in available boron, and were treated with borax and sulfur singly and in combination, sulfur sufficient to lower the pH from 7.5 to 6.2 was as efficient as borax in preventing heart rot. It was found that fixation of boron in an alkaline sandy soil, high in organic matter, was a rather slow process, as indicated by a reduction in the toxic effect of boron on soybeans when planting was delayed 2 mo. after the borax was applied.

The effect of borax on the yield, appearance, and mineral composition of spinach and sugar beets, R. L. COOK and C. E. MILLAR. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 227-234, figs. 3; *abs. in Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 150-151).—Borax, applied at the rate of 20 lb. per acre as a side dressing for sugar beets on Wisner silt loam, very nearly eliminated heart rot symptoms, increased the yield from 7.16 to 14.3 tons per acre, and the sucrose content and purity from 14.11 to 18.02 percent and from 80.92 to 84.91 percent, respectively. Applied broadcast for spinach at the rate of 10 lb. per acre, borax prevented the appearance of boron-deficiency symptoms and caused the yield to increase from 8.1 to 14.3 lb. per plat. On the plats which did not receive borax, the spinach plants developed symptoms almost identical with symptoms of heart rot in sugar beets. Borax increased the boron content of the dry tissue of sugar beet roots and of spinach roots and tops and reduced the nitrogen content of sugar beet and spinach roots. Ammonium nitrate, applied to pot cultures of Thomas sandy loam, decreased the boron content of sugar beet roots. Applications of borax decreased the percentage of iron in sugar beet roots and spinach tops. In one pot-culture experiment, borax increased the percentage of magnesium in sugar beet roots. It had no effect on the calcium content of either sugar beets or spinach.

A case of cobalt deficiency on limestone soil, K. J. McNAUGHT and G. W. PAUL (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 6A, pp. 343A-344A).—A highly calcareous soil in the Wairarapa was observed to have caused a localized case of cobalt deficiency affecting both cattle and sheep. Analyses of the soil and pastures showed a low cobalt content. The deficiency condition was overcome through the use of cobaltized salt lick.

Soil and plant tests as aids in soil fertility programs, J. B. HESTER (*Year-book Com. Fert.*, 1941, pp. 31-39, figs. 12; also in *Com. Fert.*, 63 (1941), No. 5, pp. 10-16, 18, 20, figs. 12).—The author presents a general discussion of plant nutrients in the soil and various factors that affect their availability to the plant.

Important information on these factors can be obtained through soil and plant analyses. The use of these various tools are particularly valuable in bringing about more economical production. The author suggests a working basis for minimum and maximum amounts of nitrogen, phosphorus, and potash based on plant tissue and soil tests.

Inspection of commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir. 265 (1941), pp. 89, fig. 1*).—Statistics of fertilizers sold in Indiana in accordance with the Indiana fertilizer law are presented, together with the usual analyses.

Commercial fertilizers, 1941, E. R. TOBEY (*Maine Sta. Off. Insp. 181 (1941), pp. 63-109*).—The analyses of samples of fertilizers collected and submitted during the 1941 season to the station, in accordance with the provisions of the fertilizer law (E. S. R., 84, p. 740), are presented.

Inspection of commercial fertilizers and agricultural lime products for the season of 1941, P. H. SMITH ET AL. (*Massachusetts Sta. Control Ser. Bul. 109 (1941), pp. 55*).—Detailed analytical and statistical data pertaining to the Massachusetts Fertilizer Control Service on mixed and unmixed fertilizers and on liming materials are summarized for the 1941 season (E. S. R., 84, p. 740).

Commercial fertilizers in 1940-41, G. S. FRAPS, T. L. OGIER, and S. E. ASBURY (*Texas Sta. Bul. 607 (1941), pp. 47*).—This is the usual annual presentation of data regarding fertilizers sold in Texas as required by the fertilizer control law. In addition to analyses, general information is given about fertilizers, as well as discussions on the subjects of vitamin B₁ and water culture.

AGRICULTURAL BOTANY

Plant science section (*Jour. Colo.-Wyo. Acad. Sci., 2 (1940), No. 6, pp. 35-38; 3 (1941), No. 1, pp. 33-39*).—The following abstracts of papers are of interest to agricultural botany:

Vol. 2, No. 6.—Persistence of Impermeability in Alfalfa Seeds, by A. M. Lute (p. 35), and Some Histological Studies of Winter Injured Raspberry Canes, by A. G. Simonds (p. 35) (both Colo. State Col.).

Vol. 3, No. 1.—*Trifolium fragiferum* L.—A New Immigrant Clover to North America, by J. Ewan and A. Vaughan (p. 33); Further Notes on *Suckleya* in Colorado, by F. A. Riedel (p. 34); A Natural Occurring Root Graft in Sugar Beet, by A. O. Simonds (p. 36), and Observations on the Mycorrhizal Fungi and Mycorrhizae of Four Coniferous Plantations in the Rhine Valley (p. 37) and A Survey of Northern Colorado Flora Bearing Mycorrhizae (p. 37), both by W. D. Thomas, Jr. (all Colo. State Col.); and The Effects of Some Natural Gases Upon Plants, by W. G. Solheim and R. W. Ames (p. 38) (Univ. Wyo.).

Indications of an increase in number of C-atoms in acids and number of acids in seed fats with advance in evolutionary position, J. B. McNAIR (*Science, 94 (1941), No. 2444, p. 422*).

Wayside trees of Malaya, I, II, E. J. H. CORNER (*Singapore: Govt., 1940, vols. 1, pp. VII+770, figs. 259; 2, p. [1], pls. 228*).—Volume 1 contains the text and text figures and volume 2 the plates.

Exploraciones micologicas de la America tropical: Un ejemplo de cooperacion inter-americana [Mycological explorations in tropical America: An example of inter-American cooperation], C. E. CHARDON (*Bol. Soc. Venez. Cien. Nat., 6 (1940), No. 45, pp. 218-237*).—This is a review (51 references) of work in Puerto Rico, Dominican Republic, Colombia, Venezuela, and Brazil, and of various fungus groups, with an evaluation of the results obtained.

Contribución a la bibliografía botánica Argentina, I (Contribution to the botanical bibliography of Argentina, I), A. CASTELLANOS and R. A. PÉREZ-MOREAU (*Lilloa*, 6 (1941), No. 1, pp. 5-161; *Eng. abs.*, p. 5).—This is a bibliography of the species of vascular plants of Argentina from Linnaeus' time through 1937, and part 1 includes general works and the Pteridophyta, Gymnospermae, and Monocotyledoneae.

Algunos datos sobre el maíz en Venezuela: Distribucion de las variedades botánicas [Data on corn in Venezuela: Distribution of botanical varieties], B. SCHELOTTO and A. H. MARCHIONI (*Rev. Argentina Agron.*, 8 (1941), No. 1, pp. 49-56, figs. 2; *Eng. abs.*, p. 56).—The authors made a survey (with map of distribution) of the botanical varieties and pigmentation of corn, studying 113 samples and finding the following percentages; *Zea mays indentata* 64, *Z. mays indurata* 18, *Z. mays amyloacea* 11, and *Z. mays everta* 7. The colors were 63 percent white, 31 yellow, 3.5 red, and 2.5 percent purple.

The geography of the endemic potatoes of South America, S. M. BUKASOV (*Rev. Argentina Agron.*, 8 (1941), No. 2, pp. 83-104).—The wild species are taken up under the Atlantic coast, Pacific coast, and Andean groups, and the groups of the cultivated Andean species are also considered.

Algunos datos sobre el barbasco [Some data on barbasco], L. WILLIAMS (*Bot. Soc. Venez. Cien. Nat.*, 6 (1939), No. 41, pp. 21-33).—A discussion of the plants from which the so-called fish poisons (including derris and rotenone) are obtained, with special reference to their presence, composition, production, and exploitation in Venezuela.

Plant physiology, M. THOMAS (*London: J. & A. Churchill, 1940, 2. ed.*, pp. XII+596, figs. 61).—This is the second edition of a book previously noted (*E. S. R.*, 74, p. 610).

Shock anesthesia in Myxomycetes, W. SEIFRIZ and N. EPSTEIN (*Biodynamica*, 3 (1941), No. 67, pp. 191-197).—When a plasmodium was hit by a falling drop of water or by the stroke of a needle, protoplasmic flow suddenly stopped. This is regarded as a case of anesthesia. The shock anesthesia was accompanied by a thixotropic setting or sudden gelatinization of the protoplasm. Recovery was complete if the cessation of movement from the shock was not accompanied by traumatic injury.

Mechanism of symbiotic nitrogen fixation.—V, Nature of inhibition by hydrogen, P. W. WILSON, S. B. LEE, and O. WYSS. (*Univ. Wis.*). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 91-101, figs. 4).—In this number of the series (*E. S. R.*, 80, p. 741), two methods determining the mode of action of an inhibitor for an enzyme reaction (whether competitive or noncompetitive) are illustrated by experiments in which H acts as a specific inhibitor for symbiotic N fixation in red clover. The methods are based on plotting certain functions of the rates of reaction against (1) concentration of inhibitor for two or more concentrations of substrate, and (2) reciprocal of concentration of substrate for two or more concentrations of the inhibitor. Straight lines are obtained whose slopes are tested for significant differences by appropriate statistical procedures. Results from seven experiments, five of which are here described, consistently favored the view that inhibition of the symbiotic N fixation reaction by H is competitive.

The relation of varieties of the soybean to various strains of the Rhizobia, T. PUNYASINGHA (*Thai Sci. Bul.*, 3 (1941), No. 1, pp. 11-27).—The host origin of a *Rhizobium* strain influenced its activity. Some cultures seemed to be more efficient in inoculating one variety than others, but no single culture produced the best inoculation on all 44 soybean varieties tested. While some cultures were consistently good in all of the tests, others proved very inefficient for

soybean inoculation. Indications that certain definite strains of soybean bacteria are required to produce the most efficient degree of nodulation on a given variety were obtained. There are 26 references.

Failure of barley to fix molecular N¹⁵, R. H. BURRIS (*Science*, 94 (1941), No. 2436, pp. 238-239).—The data presented indicate that if either barley or bacteria-free red clover plants fixed any N, the amount fixed was within the experimental error, whereas fixation by inoculated clover resulted in the accumulation of large amounts of the stable N isotope, N¹⁴. These results, in relation to work by others, are discussed.

Über die Abhängigkeit der Katalaseaktivität der Leguminosen von der Beschaffenheit des Impfmateri als [The relationship of catalase activity in legumes to the nature of the inoculum], M. KRONBERGER (*Prakt. Bl. Pflanzenbau u. Pflanzenschutz*, 18 (1940), No. 7-8, pp. 126-130).—It is shown that inoculation with virulent nodule bacteria increased the catalase activity of legumes, and that this increase was directly correlated with the relative virulence of the bacteria.

On the so-called "iodide oxidase" mechanism of iodide oxidation by Aspergillus, A. A. PEARCE (*Biochem. Jour.*, 34 (1940), No. 10-11, pp. 1493-1500, figs. 5).—The culture medium of *A. niger* oxidizes iodide to free I. This oxidation is not, however, catalyzed by a specific iodide oxidase or by an oxygenase as has been suggested by previous workers, but by H₂O₂ formed in the medium. This H₂O₂ is formed as a result of a primary oxidation reaction of glucose catalyzed by glucose oxidase. The oxidation of iodide is therefore a secondary oxidation reaction which can be promoted by every oxidizing system that reduces molecular O₂ to H₂O₂.

Growth-promoting and growth-inhibiting substances in the petiole [trans. title], Y. OKABE (*Bot. Mag. [Tokyo]*, 54 (1940), No. 645, pp. 357-365, fig. 1; *Jap. text; Eng. abs.*, p. 365).—The growth-promoting and -inhibiting substances diffusing from the petiole segments of *Morus alba* into agar blocks were demonstrated by the oats coleoptile method, negative curvatures being induced in young and positive curvatures in mature leaves. Similar results were found in *M. bombycis*, *Cudrania triloba*, *Ficus carica*, *Thea sinensis*, *Salix viminalis*, and *Ginkgo biloba*. Negative and positive curvatures reached their maxima 2 and 3 hr., respectively, after application of the agar. It appears that the growth-promoting substance moves basipetally in the petioles but that the growth-inhibiting substance has no polarity of movement. If the leaf blades are removed, the growth-promoting substance in the petioles appears to go on decreasing, whereas the growth-inhibiting substance continues to increase until the petiole falls.

On the distribution of growth-promoting and growth-inhibiting substances in *Morus alba* L. and *Cassia occidentalis* L. [trans. title], Y. OKABE (*Bot. Mag. [Tokyo]*, 54 (1940), No. 647, pp. 453-461; *Jap. text; Eng. abs.*, p. 461).—The distribution of growth-promoting and -inhibiting substances diffusing from the stem and root of *M. alba* and *C. occidentalis* was studied by the oats coleoptile method, the agar blocks being applied (1) on the lower and (2) on the upper sides. Negative curvatures were induced by growth-promoting substance from the upper part of the stem in (1), whereas positive curvatures were caused by the substances from the middle and basal parts of the stem. Positive curvature was caused by (2) and negative by (1) from the upper part of the stem. Evidently, the growth-inhibiting substance is masked by the growth-promoting substance, especially in the upper part of the stem.

Factors in coconut milk essential for growth and development of very young *Datura* embryos, J. VAN OVERBEEK, M. E. CONKLIN, and R. F. BLAKESLEE (*Science*, 94 (1941), No. 2441, pp. 350-351).—"The success of coconut milk in fur-

nishing some accessory substances which stimulate the growth of isolated embryos in vitro suggests its applicability to other species and prompts this preliminary report."

Vitamin B₆ and growth of excised tomato roots in agar culture, D. DAY (*Science*, 94 (1941), No. 2446, pp. 468-469).—Pyridoxine was of distinct benefit to root growth. Neither glutamic acid nor glycine in the amounts used appeared able to replace it.

Agencies affecting the production of substance B by *Rhizopus suinus*, C. L. WORLEY. (Univ. Ga.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 461-480, figs. 2).—A survey of all tests run (methods described) in this study indicated a lack of correlation between the amount of growth substance produced (i. e., total effectiveness) and the amount of *R. suinus* mycelia contributing to its production, but certain tests did indicate a relationship of substance B production with type of growth. There was no relationship between the areas exposed per unit volume and the effectiveness of the respective fungus filtrates, and, for reasons discussed, it is believed that the constant effectiveness of these filtrates indicates a lack of change in the balance between stimulators and inhibitors. White light exerted little or no effect, but yellow light reduced greatly the effectiveness of the *Rhizopus* filtrate and green lights had the opposite effect. Doubling the inoculum resulted in a significant increase in effectiveness of the ultimate filtrate. Changes in temperature had the most marked effect of any agent tried. One set of tests showed production of substance B to be directly related to the degree of aeration, and another tested the effects of filter paper on growth substance accumulation.

Biotin and the growth of *Fusarium avenaceum*, W. J. ROBBINS and R. MA (*Bul. Torrey Bot. Club*, 68 (1941), No. 7, pp. 446-462, figs. 6).—A strain of *F. avenaceum* failed to grow in a mineral-sugar solution but grew in the same solution solidified with agar, this beneficial effect being primarily due to biotin. Some agar samples contained as much as 0.1 μ g. of biotin per gram. This fungus strain was favorably affected by 0.001 μ g. of pure biotin methyl ester, but greater effects were obtained with larger amounts of biotin. Agar extract had a greater beneficial effect than could be accounted for by its biotin content. This may result from unidentified growth substances, which are believed not to be pyridoxine, pantothenic acid, thiamin, nicotinamide, *p*-aminobenzoic acid, pimelic acid, *i*-inositol riboflavin, glutamine, vitamin K₁, or ascorbic acid. Mutations which grew on a biotin-deficient medium were observed.

***P*-aminobenzoic acid, an essential metabolite for autotrophic organisms**, S. WIEDLING (*Science*, 94 (1941), No. 2443, p. 389).—The work was done on the diatom, *Nitzschia palea debilis*.

Significant rôles of trace elements in the nutrition of plants, J. W. SHIVE. (N. J. Expt. Stas.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 435-445).—As a result of this analytical review (13 references) and the studies presented, it is pointed out that the roles which may have been ascribed to B, Fe, and Mn, important as they may be, are mere incidents in the whole complex maze of physiological functions which they may indirectly assume in the vital activities of any species. Though it is impossible at present to assign any one particular process as the special function of a given trace element, it is probably safe to say that each of these elements is a critical factor in every important physiological process involved in the nutrition of the plant.

Bor und Gramineen [Boron and Gramineae], W. SCHROPP (*Forschungsdienst*, 10 (1940), No. 2, pp. 138-160, pls. 4).—This is a general review (72 references) of the nutritive relations of boron to plants, with special reference to the small grains, corn, and grasses.

The comparative boron content of potato leaves and tubers produced under different cultural conditions, R. MACVICAR, W. E. TOTTINGHAM, and

G. H. RIEMAN. (Wis. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 9, pp. 249-253).—Analyses of tubers without corresponding leaf and stem samples gave little pertinent information as to total ash content or status of B nutrition of the plant as a whole. B analyses of several potato varieties grown in three regions of Wisconsin under similar culture treatment indicated the following ranges and averages in micrograms per gram of dry tissue for different plant parts: Leaf 20.9-73.8, 38.9; stem 19.0-66.6, 32.2; and tuber 5.5-13.9, 9.2.

Effects of pH and the components of bicarbonate and phosphate buffered solutions on the metabolism of potato discs and their ability to absorb ions, F. C. STEWARD and C. PRESTON (*Plant Physiol.*, 16 (1941), No. 3, pp. 481-519, figs. 9).—The effect of pH and the concentration of a $\text{KHCO}_3/\text{H}_2\text{CO}_3$ buffer on absorption of bromide and metabolism of potato disks was investigated, using thin disks in aerated solutions at 23° C. Throughout, the effects of these treatments on the uptake of bromide, on protein synthesis, and on oxidations in the tissue catalyzed by oxidases (phenolase) were closely parallel. At constant pH, increasing the external concentration of KHCO_3 and dissolved CO_2 depressed both protein synthesis and bromide accumulation. Indirect evidence indicated that the bicarbonate solutions which retarded bromide absorption and protein synthesis also depressed respiration and carbohydrate metabolism. The similarity in the effects of these variables on both respiration and N metabolism was shown by comparing figures which indicate simultaneously the variation of the property in question (respiration, protein synthesis, or loss of soluble N) in relation to two variables (pH and phosphate concentration). Phosphates seemed to influence metabolism of potato disks through their effect on N metabolism (protein synthesis and use of amino acids), i. e., processes which appear remote from the accepted role of hexose phosphates in carbohydrate break-down. Respiration, protein synthesis, and bromide absorption are again seen to be closely linked. They are similarly affected by external variables, the effect of which on the tissue is consistently shown by reactions stimulated by the oxidase (phenolase) it contains. There are 27 references.

Accumulation of arsenic in the shoots of Sudan grass and bush bean, L. MACHLIS. (Hawaii Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 521-544, figs. 6).—When Sudan grass and bush beans were grown for different periods in various concentrations of sodium arsenite, it was found that As concentrations up to 0.5-0.6 p. p. m. had no effect on growth as measured by dry weight, but growth was suppressed at 1.2 and 12 p. p. m. of As for bean and Sudan grass, respectively. Additions of As to the solutions caused an immediate plasmolysis of the roots and wilting of the leaves, followed by discoloration of the roots and necrosis of leaf tips and margins, indicating that the As caused a sudden decrease in water movement into the plants. The As concentrations in plant tops and in each of the other parts except the reproductive structures were proportional to the concentrations in the nutrient solutions. The magnitudes of these concentrations were more or less constant during the experimental periods (up to 9 weeks). The leaves were highest, the stem tissues intermediate, and the reproductive structures lowest in As concentration. Within a narrow range of concentrations of As in the nutrient media both plants grew successfully, but they contained As concentrations in the tops in excess of the legal tolerance limit for the As content of foods. For equal relative reductions in yield the more resistant plant (Sudan grass) contained several times the concentration of As in the other species. Accumulated arsenical residues in soils as a result of insect and weed control practices are discussed as a source of As contamination in foods through absorption by plants. There are 28 references.

Alkaloid and nitrogen metabolism in the germination of *Lupinus luteus*, J. C. J. WALLEBROEK (*Rec. Trav. Bot. Néerland.*, 37 (1940), No. 1, pp. 78-132, figs. 3).—The author concludes from this study that the alkaloids of the yellow lupine take an active part in metabolism. During germination the amount of these compounds in the cotyledon decreases at the same time that it increases in the plumule and radicle. When germination occurs in darkness the decrease in the cotyledons exceeds that in the plumule and radicle during the first 3 weeks. This cannot be explained otherwise than by a decomposition of the alkaloids within the organism. If during germination one of the cotyledons is removed, a far-reaching alkaloid decomposition follows in the plumule and radicle. From this behavior it is believed that the alkaloids are not the rigid, immovable, and unassailable waste products of metabolism assumed by some investigators.

The localization of the nicotine synthetic mechanism in the tobacco plant, R. F. DAWSON. (Univ. Mo.). (*Science*, 94 (1941), No. 2443, pp. 396-397).—On the basis of the evidence at hand, the author states that nicotine is apparently synthesized in appreciable amounts only in the tobacco roots, its presence in the leaves of intact plants in higher concentrations than in either stalk or roots perhaps being due to translocation and accumulation.

Water balance in the onion root: Relation of volume intake to volume exudate of excised roots and isolated root segments, H. F. ROSENE (*Plant Physiol.*, 16 (1941), No. 3, pp. 447-460, figs. 2).—"Simultaneous determination of water absorption and exudation of excised roots and pieces of roots revealed that fluctuations in both inflow and outflow occurred from one 2-hr. interval to another in a saturated atmosphere at a temperature which did not vary more than $\pm 0.5^\circ$ C. during long intervals. The variations in outflow and inflow may be opposite in direction during any one interval. The transport ratio of outflow to inflow, volume exudation : volume absorption, was seldom unity during the first interval following excision; with time the ratio approached or reached unity. Rates of both inflow and outflow usually increase with time during a 24-hr. period following excision. The direction of longitudinal transport through an isolated piece of root depends upon its age and upon its position on the longitudinal axis before cutting. Segments consisting of the apical third of young roots less than 70 mm. in length and less than a week old exhibit basal outflow only in an upright, inverted, or horizontal position with respect to gravity; segments from the middle and basal third exhibit outflow at both ends in all three positions. The direction of transport of basal segments cut from roots over 200 mm. in length and several weeks old depends upon the orientation of the segment with respect to gravity. Isolated segments of the root manifest the longitudinal gradient of distribution of rates of absorption characteristic of the excised and intact state." There are 19 references.

A field method for the transpiration rate of grasses, A. W. BAYER (*Ann. Natal Mus.*, 9 (1940), pt. 3, pp. 381-390).—Transpiring leaves are enclosed within weighed test tubes containing strips of filter paper impregnated with dry CaCl_2 . Transpired water vapor is absorbed, and, by noting the gain in weight of the test tubes, the time for which the leaves were enclosed, and the leaf area, the transpiration rate for unit area in unit time can be calculated. A few applications to Natal grasses are given.

Photosynthesis, E. C. C. BALY (*New York: D. Van Nostrand Co.*, [1940], pp. VII+248, figs. 24).—The synthesis in living plants of carbohydrates from CO_2 and water by the agency of sunlight is discussed as a problem in physical chemistry, and "the story is told of an investigation which led in the end to the photosynthesis in the laboratory of carbohydrates from carbon dioxide and water. In subsequent chapters the photosynthesis of proteins, the mechanism of photosynthesis, and the kinetics of the process are discussed."

Plastid pigments, with special reference to their physical and photochemical properties and to analytical methods, F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Bot. Rev.*, 7 (1941), No. 11, pp. 587-648, figs. 3).—This analytical review (330 references) takes up the carotenoids and chlorophylls, considering the chemical relationships and reactions, adsorption characteristics, absorption spectra, analytical methods, and fluorescence spectra of both, and, in addition, the general physical properties and vitamin A activity of the carotenoids and the optical activity, film properties, protochlorophyll, and bacterial photosynthetic pigments with respect to the chlorophylls. Final sections discuss function in plants and previous reviews—viewpoints.

Teor em clorofila das folhas de cafeeiros diversamente sombreados e a pleno sol [Chlorophyll content of coffee leaves variously shaded and in full sunlight], C. M. FRANCO (*Rev. Inst. Café Estado São Paulo*, 16 (1941), No. 169, pp. 296-299, fig. 1; *Eng. abs.*, p. 299).—Measured colorimetrically, the amount of chlorophyll was less with increase in light intensity.

Flower and berry production by potatoes as influenced by two light intensities and two midwinter planting dates, H. O. WERNER. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 12, pp. 349-355, figs. 2).—Under an 18-hour day, flower and berry production were improved in midwinter by increasing the light intensity, accomplished either by increasing the intensity of the supplemental light or by planting later to obtain the benefit of the longer, brighter days. An increase in the average daily radiation from 226 to 254 gram calories per square centimeter appeared as effective in stimulating flowering and berry production in some varieties as increasing supplemental light from about 35 to about 115 footcandles. Increased daylight intensity was more beneficial to some varieties than increasing the supplemental light. Nine varieties which bloomed in April 1937 were not induced to bloom by any of the treatments here used.

An annotated bibliography of the low temperature relations of plants, R. B. HARVEY (*Minneapolis, Minn.: Burgess Pub. Co., 1936, rev. ed., pp. [1]+II+240*).—This bibliography is arranged alphabetically by author and provided with subject index.

Relation of temperature to the ascorbic acid content of cowpea plants, M. E. REID. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 8, pp. 519-530, figs. 5).—The rates of accumulation and disappearance of ascorbic acid, as well as the respiratory intensity and growth rate of cowpea seedlings in darkness, were successively higher at 22°, 26°, and 29° C. Differences in the total ascorbic acid content of plants grown at different temperatures were associated with differences in the amount and type of growth of the different organs. It is suggested that the lower maximum ascorbic acid content of seedlings grown in darkness at high temperatures may result from a greater metabolic loss of the vitamin or, less probably, from a decreased synthesis. Within an 18-hr. period in darkness appreciable losses of ascorbic acid from light-grown plants occurred only under temperature conditions favorable to growth. There was a lower total ascorbic acid content of plants grown in light at 29° than at 24°. Reasons are advanced to suggest that it may be chiefly a consequence of a more rapid rate of metabolic loss than of less rapid synthesis.

Studies on the embryo of *Hordeum sativum*—I, The development of the embryo, J. MERRY (*Bul. Torrey Bot. Club*, 68 (1941), No. 8, pp. 585-598, figs. 42).—The normal development of the barley embryo is described, and the development of the vascular system of the embryo is interpreted from plants grown in culture from embryos of different ages. The proembryo develops with no definite

arrangement or sequence of cell divisions. The scutellum and stem meristem begin to differentiate at 8 days after fertilization. The coleoptile is formed from a region which becomes the scutellum and is closely associated with the scutellum. The scutellum and the coleoptile are considered to be structures morphologically distinct from the foliage and peculiar to the embryo. The time of differentiation of the leaf primordia, the bundles of the leaves, and the seminal root primordia is given, and the vascular relationships of the various parts of the embryo are described.

Seed development in *Medicago* (alfalfa) hybrids.—I, **The normal ovule**, H. M. FARLEY and A. H. HUTCHINSON (*Canad. Jour. Res.*, 19 (1941), No. 11, Sect. C, pp. 421-437, figs. 22).—Seed production in alfalfa hybrids is related to many factors, primarily the cytological disturbances due to hybridization. The establishment of new balances results in strains which may occupy different habitats. Deficiencies may appear at one or more of the many stages during the complete process of growth and development. This study of the normal ovule, as a standard for comparison, deals particularly with the histogenesis and development of the nucellus, gynospores, integuments, funiculus, female gametophyte, embryo, and endosperm. Some of the food and nutrition problems associated with seed production are considered.

The anatomy of the seedling and roots of the Valencia orange, H. E. HAYWARD and E. M. LONG (*U. S. Dept. Agr., Tech. Bul.* 786 (1942), pp. 32, figs. 22).—Seedling development in *Citrus sinensis* is hypogeal, and frequently multiple seedlings arise from one seed complex, resulting in spatial competition. Anatomical and histological details are presented. Numerous root hairs are produced under favorable conditions, and these become suberized or lignified and may persist until a hypodermal periderm is developed. The hypodermis may produce secondary root hairs or absorbing areas consisting of groups of thin-walled, radially elongated cells. Lenticels also may be formed. Lateral roots of Valencia and other sweet orange strains resemble the primary root in ontogeny, but the number of primary xylem strands may range from three to eight, tetrarch and pentarch being the most common. Growth in length and secondary thickening are slow. Under unfavorable conditions, elongation is inhibited and the hypodermal periderm extends to the proximal margin of the root cap. The vascular transition occurs in a very short portion of the hypocotyl immediately below the cotyledonary node. The anatomy of the first internode and first foliage leaves is described.

Structure of the cotton fiber as revealed by the microscope, C. W. HOCK and R. C. RAMSAY (*Sci. Mo.*, 53 (1941), No. 6, pp. 519-523, figs. 6).

Apomixis in the angiosperms, G. L. STEBBINS, JR. (Univ. Calif.). (*Bot. Rev.*, 7 (1941), No. 10, pp. 507-542, fig. 1).—This comprehensive review (six pages of references) aims partly to revise and enlarge the one by O. Rosenberg¹, and partly to show the connection between the problems of apomixis and other major problems. The subject matter is discussed under terminology and description of the phenomena, evidence from apomixis as to the nature of meiosis, apomixis and the alteration of generations, hypotheses as to the cause of apomixis, and apomixis in relation to species differentiation and plant distribution—the agamic complex.

The protoplasmic membrane regarded as a complex system, H. L. BOOIJ (*Rec. Trav. Bot. Néerland.*, 37 (1940), No. 1, pp. 1-77, figs. 76).—The four chapters of this monographic study deal, respectively, with a general introduction to the subject, experiments with *Lathyrus*, the influence of various compounds on

¹ Handb. Vererbungsw., 2 (1930), L, pp. [1]+66, figs. 32.

baker's yeast, and general conclusions regarding the selection of experiments from which the structure of the membrane can be derived and the protoplasmic membranes of *Lathyrus* pollen and bakers' yeast. There are 101 references.

Clave de generos para clasificar bacterias con arreglo a la quinta edicion del libro de Bergey [Key to bacterial genera according to the classification in the fifth edition of the Bergey manual], C. A. BERTACCHINI (*Agronomia [Buenos Aires]*, 30 (1940), No. 1, pp. 51-70).—This is a key to the book previously noted (E. S. R., 81, p. 489).

A nucleus-like structure in a staphylococcus, G. KNAYSIL (Cornell Univ.). (*Science*, 94 (1941), No. 2436, p. 234).

Inactivation of enzymes as the cause of death in bacteria, O. RAHN and W. R. SCHROEDER (Cornell Univ.). (*Biodynamica*, 3 (1941), No. 68, pp. 199-208).—According to some biologists, death of the cell is due to the inactivation of its enzymes. The "logarithmic order of death" of bacteria is believed by some to be the necessary consequence of the "logarithmic order of enzyme coagulation." All experimental evidence at hand indicates that it is possible to kill the cell without destroying the enzymes. A study of the death of cells and of the loss of enzyme activity in *Bacillus cereus* under the action of heat indicated that previous evidence considered to support the enzyme theory of death involved faulty technic. The monomolecular inactivation of enzymes is said to have nothing to do with the logarithmic order of death. "If there are many enzyme molecules per cell, all the cells would reach the same stage at the same time and not in a logarithmic sequence. If inactivation of only a few molecules causes death, the order will resemble that for higher organisms. The logarithmic order is established only if death is caused by the reaction of one single molecule."

GENETICS

Accion biologica de las radiaciones en relacion con la produccion de mutaciones en los vegetales [Biological action of radiations in relation to the production of mutations in plants], F. WORSCHITZ (*Agronomia [Buenos Aires]*, 30 (1940), No. 1, pp. 37-50, figs. 6).—An address referring to the effects of such irradiations as ultraviolet light, X-rays, and radium.

An inversion, a reciprocal translocation, trisomics, and tetraploids in barley, L. SMITH. (U. S. D. A. coop. Mo. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 12, pp. 741-750, figs. 2).—Cytological studies were made on barley plants mainly from varieties and strains of *Hordeum vulgare*. About 20 percent of the pollen mother cells in two plants of one progeny had a bridge or fragment or both at the first division, configurations interpreted as due to crossing over in a heterozygous inversion. A reciprocal translocation is described. Limited observations indicated that in about 60 percent of the pollen mother cells, segregations of the chromosomes were disjunctional. Fertility was about 65-percent perfect in three ring-forming plants. Observations on meiosis in two of three trisomic plants are recorded. Meiosis, fertility, and chromosome number in three strains of tetraploid barley were also described. Examination of mutants and varietal hybrids revealed a meiotic disturbance as characteristic of only one mutant.

The occurrence of a spontaneous triploid celery, T. W. WHITAKER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 346-348, fig. 1).—A single plant, apparently a hybrid of *Apium prostratum* and *A. graveolens* (the common celery), found in a planting of the first species is described. The presumed hybrid had 33 somatic chromosomes as compared with 22 in each of the sup-

posed parents. Only a small percentage (from 5 to 10) of the pollen appeared viable, and the plant was completely sterile. The hybrid flowered in the first year and had since assumed a perennial habit. It is suggested that this plant arose through failure of reduction at meiosis of one parent and the consequent fusion of the reduced gamete with an unreduced gamete. Backcrosses of the triploid to both parents failed to produce viable seed.

Productivity of F_1 hybrids in the squash, *Cucurbita maxima*, A. E. HUTCHINS and F. E. CROSTON. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 332-336).—A study of total yields, yield of mature fruit, weight per fruit, number of fruits per plant, and maturity in 10 squash crosses and their parents showed that seven of the F_1 -generation hybrids produced significantly higher yields than the more productive parent. In general, F_1 s of crosses between parents differing considerably in their external characters were more productive than those of crosses between closely related strains. The combined effect of weight per squash, number of squashes per plant, and maturity appeared to influence increases in yield. In eight reciprocal crosses, there was no difference in total yield in the F_1 . In three others between large- and small-seeded parents there was a significantly greater yield when the larger-seeded variety was used as the mother parent. It is suggested that the difference may have resulted from the restricting effect of the seed coat of the smaller-seeded parent on the F_1 embryo.

Size inheritance in tomato fruits, J. W. MACARTHUR (*Jour. Hered.*, 32 (1941), No. 9, pp. 290-295, figs. 3).—Plants of four tomato varieties and of the six F_1 crosses between them, grown under like conditions, were set in the field in a 10 x 10 Latin-square arrangement with border plants. The weights of from 10 to 20 mature fruits recorded for each plant revealed distinctly orderly and predictable relations. It was evident that size genes determining fruit weight in the tomato had acted in a proportionate or geometric manner.

[Experiments in animal genetics and physiology of reproduction by the Bureau of Animal Industry]. (Partly coop. expt. stas. et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1941, pp. 4, 5, 11-12, 13-14, 17, 18, 19-21, 25-27, 28, 29-30, 31-33, 35-40).—There are included progress reports on investigations on record of performance and the inheritance of growth and conformation in horses, cattle, sheep, swine, and poultry; collection and preservation of semen and artificial insemination of cattle, sheep, and swine; inheritance of intelligence and temperament in dogs; effects of inbreeding strains of mice; steroids and sex hormones; inheritance of qualities for beef and lamb production; cross-breeding in sheep and cattle; transmission of meat qualities in rabbits; lot feeding cattle for progeny testing; ovulation, morphology of ram sperm, fertility, and movement of sperm in the genital tract of ewes; sire testing and establishment of lines in sheep; inbreeding Rambouillets; duration of gestation in range sheep; breeding and inheritance of quality of staple and covering in fleece of Rambouillet and Navajo sheep; line-breeding of milk goats for milk and butterfat production and inheritance of hermaphroditism in goats; reproductive efficiency of sows and scoring market pigs; pregnancy determination in swine; improvement of swine through application of breeding methods; physiological study of artificial insemination and reproduction in mares; inheritance of tendency to blood spot formation and physiology of egg formation and quality in poultry and relation of endocrines, especially the pituitary, to reproduction; breeding turkeys for small size; and breeding, management, nutrition, and pathology for improved viability at the Regional Poultry Research Laboratory.

[Genetic studies by the Alabama Station] (*Alabama Sta. Rpt.* 1940, pp. 23, 29-30).—Studies by J. C. Grimes and P. D. Sturkie deal with the hereditary

factors associated with economy of gains in swine and the effects in poultry of induced changes in the developmental environment of certain genes.

[Genetics and physiology studies with animals at the Colorado Station] (*Colorado Sta. Rpt. 1941, pp. 15, 36*).—Brief reports are presented on the occurrence of parrot mouth in lambs sired by one ram and on the relationships of thyroid to thymus and of thyroid to gonadotropic hormones.

Primenenie serologicheskikh metodov v izuchenii neskreshchivaemosti pri otdalenoj gibrizatsii (Application of serological methods in investigation of incompatibility in distant crosses), I. I. SOKOLOVSKAJA (I. I. SOKOLVSKAJA) (*Akad. Nauk. S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 249-276, figs. 7; Eng. abs., pp. 275-276*).—Antibodies to the spermatozoa of different species and a high antiembryonic titer of the blood of ♀ goats pregnant with hybrid embryos are taken as indications of incompatibility between the different species.

Izmenchivost' i nasledovanie prodolzhitel'nosti embrional'nogo razvitiia (Variability and inheritance of the duration of embryonic development), B. N. VASIN (VASSIN) (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 155-174, figs. 2, Eng. abs., pp. 173-174*).—Differences in the embryonic development within different breeds of rabbits, pigs, sheep, and cattle are so great as to be regarded as breed characteristics. It is pointed out that the gestation periods of these animals, except for the pig, are inversely in the order of the number in the litter. Season, sex of the fetus, and age of the dam are also influential factors.

K genetike biokhimicheskikh priznakov u zhivotnykh v svyazi s ikh rostom (A contribution to the genetics of the biochemical characters in animals in relation to their size), V. I. PATRUSHEV (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 121-153, figs. 6; Eng. abs., pp. 152-153*).—The glutathione concentration of cattle and sheep differed according to breed, but the individual animals remained relatively constant, gradually decreasing after 3 yr. of age. The catalase index was higher in calves than in adults, but there was no reduction with age in adult animals. On an average, body weight was associated with glutathione concentration and catalase activity in the blood.

Polosatye domashnie loshadi (Stripings in domesticated horses), I. A. I. A. (J. J.) LUS (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 297-319, figs. 15; Eng. abs., p. 319*).—Striping in horses occurs in many domestic breeds as a mutation analogous to brindling in cattle and dogs.

Sostav krovi krupnogo rogatogo skota v svyazi s ego produktivnost'iu (Blood content of cattle in relation to their productivity), K. F. (H. F.) KUSHNER (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 95-120, figs. 9; Eng. abs., pp. 119-120*).—A definite correlation was found between the oxidizing ability of the blood, as determined by hemoglobin content and number and size of erythrocytes, and the rate of growth and productivity in cattle. Bulls had a greater concentration and smaller size of erythrocytes and a higher hemoglobin content than cows, but the reverse occurred in calves.

Khromosomy v spermatogeneze odnogorbogo verbluda (*Camelus dromedarius* L.), dvugorbogo verbluda (*Camelus bactrianus* L.) i F₁-gibrida mezhdu nimi (Chromosome behaviour during spermatogenesis in camels *Camelus dromedarius* L. and *Camelus bactrianus* L. and their F₁-hybrid), I. I. Novikov (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 285-296, figs. 3; Eng. abs., pp. 295-296*).—No particular distinctions could be found in the

form or number of chromosomes between dromedary and bactrian camels or hybrids between them. The haploid number was 35 in all cases, and there seemed no reason for sterility.

Sostav krvi ovetŝ v svĭzĭ s ikh produktivnost'ŭ (Blood content in sheep in relation to their productivity), K. F. (H. F.) KUSHNER (*Akad. Nauk S. S. S. R., Trudy Īnst. Genet. (Bul. Inst. Genet.)*, No. 13 (1940), pp. 57-94, figs. 6; *Eng. abs.*, pp. 92-94).—Studies of the hemoglobin and blood values of sheep showed that the greatest body weight was displayed by animals which possess a higher hemoglobin content and greater concentration of erythrocytes. These findings occurred between breeds and within breeds. The highest hemoglobin content and largest concentration of erythrocytes were displayed by newborn lambs and decreased to 7-14 days of age, followed by increases in ewe lambs 40-50 days of age and in yearling ewes. The diameter of the erythrocytes was 0.3μ smaller in ♂s than in ♀s.

Nasledovanie pegosteĭ u chernykh karakulevykh ovetŝ (Inheritance of white spottings in black Karakul sheep), E. P. PANFILOVA (*Akad. Nauk S. S. S. R., Trudy Īnst. Genet. (Bul. Inst. Genet.)*, No. 13 (1940), pp. 331-338, figs. 3; *Eng. abs.*, pp. 337-338).—There was found to be a correlation between the white spotting on the back of Karakul sheep and white spots on the tail and head, thus permitting breeding of one parent having white spotting on the tail only with an all-black animal.

Opyt gibrizizatsii dikogo barana arkhara (Ovis polii karelini Sev.) s merinosami novokavkazskogo tipa (Ovis aries hispanica) (Interspecific hybridization between the wild sheep (Ovis polii karelini Sev.) and New-Caucasian Merino sheep (Ovis aries hispanica), N. S. BUTARIN (*Akad. Nauk S. S. S. R., Trudy Īnst. Genet. (Bul. Inst. Genet.)*, No. 13 (1940), pp. 175-247, figs. 30; *Eng. abs.*, pp. 223-226).—Hybrid lambs were produced by New-Caucasian Merino ewes through artificial insemination with sperm from wild Arkhar rams shot in the mountains. They showed a general dominance of the weights, measurements, and temperament of the wild type. The 69 lambs so produced by 58 ewes were like the Arkhar parent, were heavier than Merinos, and grew more rapidly. All progeny from crosses with horned Merinos had horns, but from crosses with hornless Merino sheep all the ♂s and 9 ♀s were horned and 6 ♀s were hornless. The form of the horns was that of the Arkhar. The wool qualities of the F₁ were inherited mainly from the Merino, although there was not complete dominance, but the structure of the fiber was from the Arkhar. In color there was dominance of the white of the Merinos, but other factors or modifiers produced over 90 percent F₁ progeny with red in the wool. The 2n chromosome number of both species was 60.

Analiz potomstva barana porody karakul', osemiŭvshego 5 tys. matok (Analysis of the offspring of a Karakul ram used for insemination of 5,000 ewes), E. P. PANFILOVA (*Akad. Nauk S. S. S. R., Trudy Īnst. Genet. (Bul. Inst. Genet.)*, No. 13 (1940), pp. 321-329; *Eng. abs.*, p. 329).—The lambs produced by ewes having fleeces of different quality showed that the best-grade Karakul lamb fleeces were produced by the progeny of fine-curl dams.

A note on the effect of multiple births on the sex ratio in sheep, K. RASMUSSEN (*Sci. Agr.*, 21 (1941), No. 12, pp. 759-760).—Among 3,711 lambs born in several breeds from 1934 to 1940 there were excesses of ♀s among the twins or of like sex in all of the breeds. In singles there was an excess of ♂s.

Die physiologischen Verhältnisse beim Gebäraht des Schweines und ihre Beziehungen zu einigen Leistungsausserungen [The physiological relations of parturition in swine and their relation to reproductiveness], H. SCHÄFER (*Ztschr. Tierzücht. u. Züchtungsbiol.*, 48 (1941), No. 3, pp. 207-254).—The rela-

tions of various conditions, such as parity, season, weight, mortality, and sex of the young, are tabulated for 1,002 young born in Landschweine and pure German Berkshire litters and crosses between them. In general, it was found that the first to fourth litters of a sow usually had a shorter gestation period, with higher livability, than the fifth to eighth litters. Importance is attached to the length of time of birth.

Genetic aspects of pigment production in the guinea pig, M. T. HARMAN and A. A. CASE. (Kans. State Col.). (*Genetics*, 26 (1941), No. 5, pp. 474-486, figs. 3).—In a histological study of the pigment formation in the guinea pig, as described by Bogart and Ibsen (E. S. R., 78, p. 769), blocks of skin from fetuses 43 to 57 days of age and a few newborn and adult animals were fixed and correlated with the appearance of the living animal at various ages. Two types of pigment, granular and diffuse, were observed. The granular type was red, black, chocolate, or colorless. Diffuse pigment ranged in shade from pale yellow to a deep red-brown. The earliest stage of pigment formation was observed in 43-day fetuses. Diffuse reddish pigment was found in *C* red and dark hairs and in *c^r* dark hairs, but not in *c^r* and *c^a* white hairs. The influence of different genes on the color of hair is concluded to be as follows: "The factor *E* may determine the presence of dark granules. The factors *B* and *b* determine whether these granules are black or chocolate. The factor *e* in the homozygous condition may determine the presence of red granules. The factors *B* and *b* may produce 'dark' and 'light' red granules. In the presence of the factor *C*, both *E* and *e* may act as described above. In the presence of the factor *c^r*, in the homozygous condition, *E* may act as described, but *e* may produce only colorless granules or none at all. Where the factor *c^a* is present in the homozygous condition, *E* does not produce dark granules and *e* does not produce red granules. Unless other factors are present, the hairs of *c^rce* and *c^a* animals are white. The action of the factors in the light and dark areas of *c^p* (spotted) animals corresponds to that in *e* and *E* animals, respectively. In the skin, the factors *E* and *e*, *C*, *c^r* and *c^a* may affect the amount rather than the kind of pigment present. Where there is a small amount, it is found chiefly in the extremities. The factors *B* and *b* may control the color of the pigment in the skin and act in the presence of either *E* or *e*."

Sensitivity to estrogen studied by means of experimentally induced mating responses in the female guinea pig and rat, J. G. WILSON and W. C. YOUNG (*Endocrinology*, 29 (1941), No. 5, pp. 779-783).—The response of guinea pigs ovariectomized at birth and at 30 and 85 days of age to 10 rat units of oestradiol benzoate, followed by 0.1 International Unit of progesterone 48 hr. later, showed by the manual mating response of Blandau et al. (noted below) that the sensitivity increased greatly during the first month of life. At 7 days, the animals were insensitive, but by the thirtieth day of age the threshold was maintained to at least the twenty-fourth month. The response was independent of uterine and ovarian influences, since similar results were obtained in ovariectomized guinea pigs and rats, with and without hysterectomy. The rat maintained its 30-day sensitivity through at least the tenth month.

The length of heat in the albino rat as determined by the copulatory response, R. J. BLANDAU, J. L. BOLING, and W. C. YOUNG (*Anat. Rec.* 79 (1941), No. 4, pp. 453-463, fig. 1).—The average length of 609 heat periods ascertained by reaction to manual manipulation in 114 rats was 13.7 hr. The beginning of heat was most frequent between 4 and 10 p. m., and 87 percent of 567 cycles were from 4 to 6 days in length, with an average of 4.4 days. Hourly tests for sexual receptivity were made for the determination of the stages of the cycle, and, although there was individuality exhibited in successive cycles,

the method did not interfere with the duration or recurrence of successive cycles.

The vaginal smear picture, sexual receptivity, and time of ovulation in the albino rat, W. C. YOUNG, J. L. BOLING, and R. J. BLANDAU (*Anat. Rec.*, 80 (1941), No. 1, pp. 37-45).—Behavior of the animal was considered the best indication of the beginning and end of oestrus and ovulation in the rat. Observations on a group of normal ♀ rats showed that the beginning of heat was usually associated with the first appearance of cornified epithelial cells, but the end of heat was not so closely marked. In most cases the end of heat was marked by the reappearance of nucleated epithelial cells. Ovulation was often associated with the normal condition, but in most animals it occurred when cornification was complete.

The duration of the fertilizing capacity of spermatozoa in the female genital tract of the rat, A. L. SODERWALL and R. J. BLANDAU (*Jour. Expt. Zool.*, 88 (1941), No. 1, pp. 55-64).—Estimation of ovulation by the methods noted above indicated the maximum duration of fertilizing capacity of rat spermatozoa introduced by artificial insemination in 184 ♀s as 14 hr., but there was a definite reduction in fertilizing ability of spermatozoa kept in the ♀ tract 10 hr. or longer before ovulation. No abnormal pregnancies or modified sex ratios were noted, but litter size was reduced.

An hereditary absence of the incisor teeth, R. O. GREEP (*Jour. Hered.*, 32 (1941), No. 11, pp. 397-398, figs. 2).—A tooth anomaly in which the incisors failed to appear was noted in rats. The condition behaved as a simple recessive to the normal. One pair of defective animals produced 11 progeny, all without incisors. Expected results were obtained in matings of homozygous and heterozygous normals. Anomalous animals in the colony also showed a hemorrhagic exudate from the eyelids.

Crosses between inbred strains of mice, O. N. EATON. (U. S. D. A.). (*Jour. Hered.*, 32 (1941), No. 11, pp. 393-395).—The weights, growth, and viability of inbred, crossbred, and backcross strains of mice largely substantiated the principles previously set forth for the guinea pig (E. S. R., 85, p. 177). The crossbred strains and progeny from them largely surpassed the inbred and random-bred strains, respectively, in percentage of successful matings, size of litter at birth and at weaning, and in birth and weaning weights. The viability and weights of a synthetic strain produced by the intermating of F₂ hybrids gave promise in the development of a superior strain.

Studies on hereditary congenital baldness in the domestic fowl.—I, Embryological and physiological bases of the character, P. D. STURKIE. (Cornell Univ.). (*Jour. Morphol.*, 69 (1941), No. 3, pp. 517-535, figs. 9).—Congenital baldness in fowls due to a recessive autosomal gene was associated with bleb formation of 6- to 11-day-old embryos. Microscopic study of the blebs of the embryos showed them to form by the separation of the dermis from the epidermis with the accumulation of bleb fluid and to prevent feather formation. There was a complete absence of feather papillae in the bald areas.

Vozrastnaja izmenčivost' ekster'era u utok (Variability of external forms during the post-embryonic development in ducks), B. F. RUMJANŤSEV (RUMJANCEV) (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.)*, No. 13 (1940), pp. 43-55, figs. 2; *Eng. abs.*, p. 55).—Various breeds of ducks possessed peculiarities characteristic of their breeds, although they followed the general pattern characteristic of mammals.

O kariotipakh nekotorykh ptičs (A contribution to the karyotypes of certain birds), I. I. SOKOLOVSKAJA (I. I. SOKOLOVSKAJA) (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.)*, No. 13 (1940), pp. 277-284, figs. 4; *Eng.*

abs., pp. 283-284).—The morphology of the chromosomes of ducks, pheasants, and pigeons is compared.

How hatcherymen can solve the sexing problem, T. C. BYERLY. (Univ. Md.). (*Md. Agr. Soc., Farm Bur., Rpt., 25 (1940), pp. 319-320*).—An outline is given of the methods of separating sexes by sex-linked characters.

Opyty po épigamnomu pereopedeleniiú pola plúts (Attempts on induction of epigamic sex reversion in birds), Ī. Ī. SOKOLOVSKAĪĀ (I. I. SOKOLOVSKAJA) and V. K. MILOVANOV (*Akad. Nauk S. S. S. R., Trudy Inst. Genet. (Bul. Inst. Genet.), No. 13 (1940), pp. 339-346; Eng. abs., p. 346*).—The sex ratios of chicks hatching from eggs injected with novo-ovaricin into the air chamber on the third to sixth and seventh to twelfth days of incubation were 38.8 percent ♂ and 67.2 percent ♀, with a mortality of 33.8 percent. The sex ratio was modified by the greater mortality of the ♂s. The sexes of chicks from eggs uninjected and eggs injected with folliculin approached equality, and mortality was reduced.

Interaction of antigens in dove hybrids, R. W. CUMLEY and M. R. IRWIN. (Wis. Expt. Sta.). (*Jour. Hered., 32 (1941), No. 12, pp. 429-434, figs. 3*).—A pictorial representation of the antigenic relations of Pearlneck and ringdoves and the F₁ between them, previously noted (E. S. R., 86, p. 178), showed the operation of one antigen or group of antigens common to all three types, other antigens specific for each of the three types, and fifth and sixth antigens or groups of antigens common to the F₁ and one or the other species.

A new diluent for bovine semen, C. E. KNOOP. (Ohio Expt. Sta.). (*Jour. Dairy Sci., 24 (1941), No. 10, pp. 891-892*).—Motility was maintained for an average of 12.5 days in 50 percent of bovine spermatozoa by holding semen samples in a diluent consisting of gelatin, KH₂PO₄, Na₂HPO₄·12 H₂O, and fresh egg yolk at from 4° to 6° C. The semen was collected and diluted under sanitary conditions with gradual cooling to 5°. Without gelatin in the diluent, motility was maintained an average of only 8.3 days in 50 percent of the spermatozoa.

Influence of age and presence of the ovaries on reproductive function in rats injected with androgens, J. G. WILSON, J. B. HAMILTON, and W. C. YOUNG (*Endocrinology, 29 (1941), No. 5, pp. 784-789*).—In further studies of the effect of testosterone propionate injections on the reproductive functions of ♀ rats (E. S. R., 84, p. 749), injections of 36 mg. administered in 12 doses over a period of 4 weeks, begun at 15, 20, 30, 40, or 120 days of age, had no effect on the mating response to oestradiol benzoate. Permanent defects in ovarian structure and mating response to oestrogens followed injection of the androgen begun at 5 and 10 days of age. Ovariectomized animals gave similar responses, showing that the decreased response to oestrogen caused by androgens did not result from ovarian secretions.

Studies on the histology and physiology of the pituitary of rats treated with progesterone, E. CUTULY (*Endocrinology, 29 (1941), No. 5, pp. 695-701*).—In no case did injections of from 0.5 to 3 mg. of progesterone per day into castrated ♂ and ♀ rats, whether administered immediately after castration or when delayed, correct castration changes in the anterior pituitary. Progesterone was also found to be a weak gonadotropic depressant in parabiotic rats, more than 3 mg. daily being required for an effective dose. Progesterone did not show any selective inhibitory action on the tubular and interstitial elements of the testis. The study was conducted with 19 castrated ♂ and ♀ rats with their controls and 7 parabiotic pairs.

Purification of thyrotropic hormone of the anterior pituitary, J. and H. FRAENKEL-CONRAT, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem., 135 (1940), No. 1, pp. 199-212*).—Details of the purification of the thyrotropic hormone from extracts of beef anterior pituitaries are described.

The final product represented a hundredfold purification with recovery of about one-third of the total thyrotropic activity. It contained about 10 percent of the interstitial cell-stimulating hormone but little of the lactogenic, adrenocorticotropic, growth-stimulating, or follicle-stimulating hormones.

Effect of testosterone propionate on various responsive organs of immature rats, W. FREEMAN and R. SMALL (*Endocrinology*, 29 (1941), No. 5, pp. 758-761, fig. 1).—The uterus was found to be by far the most sensitive target organ in studies of the effects of doses of 0.5, 1, 2, 4, 8, and 10 mg. of testosterone propionate administered on three successive days to 20- to 25-day-old littermate rats. The most sensitive organ-indicator in ♂s was the ratio of the seminal vesicle to prostate weight, but this was less responsive than the uterus. Doses as small as 0.2 mg. were effective in stimulation of uterine growth. Determinations were made of other organ weights, including the ovaries, testis, and thymus.

Molecular-equivalents versus weight-equivalents in the potency of androgenic substances, E. OPPENHEIMER, R. R. GREENE, and D. NELSON (*Endocrinology*, 29 (1941), No. 5, pp. 755-757).—After 21 days' treatment with daily doses of 0.2 mg., applied in an ointment by inunction to castrated rats, testosterone produced prostates significantly heavier than those produced by testosterone propionate. However, when administered on a molecular-weight basis, 0.239 mg. of testosterone propionate was no longer inferior to 0.2 mg. of testosterone.

Body and muscle growth in normal and castrate albino mice, P. ENGEL (*Endocrinology*, 29 (1941), No. 5, pp. 852-853).—There was almost no difference in the weights at 2 mo. of age among groups of 10 normal rats and 10 rats castrated at 17 mg. in weight, but the leg muscles in relation to body weight were much heavier in normal ♂s.

FIELD CROPS

Bibliography of field experiments, H. M. STEECE, F. R. IMMER, and H. M. TYSDAL (*Jour. Amer. Soc. Agron.*, 31 (1939), No. 12, pp. 1049-1052; 32 (1940), No. 12, pp. 984-986; 33 (1941), No. 12, pp. 1124-1127).—Additions to the bibliography on standardization of field experiments as revised and supplemented (E. S. R., 80, p. 758) comprise 197 titles of contributions on methodology and interpretation of results of field and grassland research.

How to determine which of two variables is better for predicting a third variable, W. D. BATEN. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 695-699, figs. 2; *abs. in Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, p. 152).—Applications of Hotelling's test for determining which of two variables is better for predicting a third when the variables are linearly related pertain to length of a wheat spike v. number of spikelets with grain per spike to predict number of kernels per spike and to length v. width to predict areas of bean leaflets.

[Agronomic research in Alabama, 1940] (*Alabama Sta. Rpt. 1940*, pp. 21-22, 30, 39-40, 41, 45).—Experiments with field crops and related research at the station and substations (E. S. R., 85, p. 470) are reported by H. R. Albrecht, E. L. Mayton, D. G. Sturkie, H. B. Tisdale, J. B. Dick, J. T. Williamson, F. E. Bertram, J. K. Boseck, R. C. Christopher, H. A. Ponder, J. W. Richardson, R. W. Taylor, E. V. Smith, C. L. Isbell, J. F. Duggar, and H. S. Swingle. The studies comprised cotton breeding; variety tests with corn; response of kudzu to fertilizer treatments; the effect of method of preparation of land for cotton on the properties of the fiber and the composition of the seed; comparisons of fertilizers of different analyses applied at different rates for cotton; experiments to determine a practicable combination of times of plant-

ing and harvesting and storage methods to be used with sweetpotatoes on the average farm to provide a supply for home use throughout the year; differences among white clover strains in germination and effects of scarification on germination and stands; effects of exposure on the soil surface on germination of untreated crotalaria seed and seed production from different planting rates; stands from scarified sericea lespedeza seed sown at different rates; effects of crotalaria and sericea plowed under on corn yields and of 2-yr. sericea stubble on Sudan grass growth; control of *Najas* (*Najas guadalupensis*) and *Potamogeton* sp. in fish ponds by fertilization, spatterdock (*Nuphar advena*) by cutting, and watershield (*Brasenia schreberi*) by leaf removal; and the life history of nutgrass (*Cyperus rotundus*) as related to possible methods of control.

[**Field crops and range research in Colorado.**] (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt. 1941, pp. 9-10, 12, 18, 30, 41-44*).—Crops investigations (E. S. R., 84, p. 612) reported on briefly included breeding work with corn (and hybrids), barley, and sorghums; determination of linkage relationships in barley; breeding work and variety and fertilizer tests with potatoes; studies on natural revegetation of native range, involving different grazing methods, experiments on increasing the grazing capacity of sagebrush lands, artificial reseeding with native and introduced grasses of depleted range and abandoned croplands and measurement of their grazing capacities, comparison of sources of seed of native grasses, a study to ascertain the extent of damage to range forage by grasshopper defoliation, and range resource surveys; and weed control.

The effect of green-manure crops on certain properties of Berks silt loam, S. S. OBENSHAIN and P. T. GISH (*Virginia Sta. Tech. Bul. 73 (1941), pp. 12, figs. 2*).—Effects on corn yields of eight green manures sown in the corn at the last cultivation were measured on Berks silt loam near Staunton. The green manures were compared with sodium nitrate and no green-manure crop or N fertilizer as to effects on corn yield and cumulative effects on certain soil properties. Average yields for corn crops harvested 1924-29, 1933-34 were in the order vetch, crimson clover, red clover, sodium nitrate, soybeans, sweetclover, cowpeas, check, rye, and buckwheat. Organic matter and N contents of all soils were increased over the check, but the increases were very small after rye and buckwheat. The C-N ratio of the soil varied from 8.58 on the plat receiving sodium nitrate to 11.42 on the plat growing rye as a green manure. Organic matter content of the soil was very closely related to all physical properties studied. Differences evident in the workability of the soil on the different plats were not reflected in plow-draft measurements.

The grasslands of Latin America, R. O. WHYTE (*Chron. Bot., 6 (1941), No. 19-20, pp. 443-446*).—A review (18 references).

A comparison of Hardigan and Ladak alfalfa in their reactions to leafhopper infestation, S. T. DEXTER. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 33 (1941), No. 11, pp. 947-951, fig. 1*).—Hardigan and Ladak alfalfa reacted in a similar manner to leafhopper injury and to the general effects of cutting management. In neither variety did relatively severe leafhopper infestation occasion serious reduction in cold resistance, or in carbohydrate storage, or in subsequent yield of the plants. Such reduction does not appear likely under comparable conditions, provided cutting or grazing management is such that abundant organic reserves are stored before heavy freezes occur.

Effects of boron on yield and duration of alfalfa, T. B. HUTCHESON and R. P. COCKE (*Virginia Sta. Bul. 336 (1941), pp. 9, figs. 5*).—Experiments, 1939-41, at Williamsburg and Chatham wherein borax was applied to alfalfa grown on fertilized and limed plats and at several rates per acre demonstrated that B deficiency in alfalfa soils might be corrected by applications of from 10 to 20 lb.

of commercial borax to the acre, either when the crop is planted or as top dressings before spring growth starts. Such applications of borax on B-deficient soil will increase alfalfa hay yield greatly, stimulate alfalfa seed production, and increase the thickness and duration of the stand. Borax may be applied after any cutting of hay if B deficiency symptoms, i. e., yellow and reddish-purple colored leaves accompanied by stunted plant growth and abortive bloom buds, have been noted. It may be applied with fertilizers, lime, or other convenient carriers used in quantities enough to insure even distribution. Since borax used in excessive quantities is toxic to many crops, not more than 20 lb. to the acre should be applied annually for alfalfa and used only experimentally on other field crops if at all.

Reducing barley failures in Maryland, R. G. ROTHGEB. (Md. Expt. Sta.). (*Md. Agr. Soc., Farm Bur., Rpt., 25 (1940), pp. 204-207*).—Varieties, cultural operations, and disease treatments are suggested to insure crops of barley.

Factors affecting the germination of bulblets of bulbous bluegrass, *Poa bulbosa*, V. K. TOOLE. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 33 (1941), No. 11, pp. 1037-1045, figs. 5*).—Bulblets about 1 mo. old germinated better at 5° C. than at 10° or 20° constant temperatures and better with potassium nitrate than with water. Those about 4 mo. old also germinated better at 5° than at 10° or 20°. Germination at a temperature alternation of from 5° to 15° was faster than at a constant temperature of 5°, but complete germination of viable bulblets was obtained only by prechilling bulblets at 5° for 7 or 14 days followed by germination at 10°. As bulblets aged they tolerated higher germination temperatures. Bulblets about 2 and 4 yr. old germinated faster at 20° than at lower temperatures, but final germination was comparable at 10°. The 2-year-old bulblets required 49 days for completion of germination at 5°.

Bulblets containing about 13 percent of moisture, stored unsealed at room temperature, afterripened so that after 10 months' storage they germinated equally well at 5°, 10°, or 20°, but had fallen in viability after 25 months' storage. Similar bulblets stored in sealed containers at 10° or at 2° showed no appreciable loss of viability in 25 mo., and maximum germination was obtained at 5° and at 10° but not at 20°. Those stored at -10° became more resistant to germination conditions tried, and maximum germination was not obtained.

Bulk emasculation and pollination of smooth brome grass, *Bromus inermis*, W. E. DOMINGO. (Utah Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 33 (1941), No. 11, pp. 993-1002*).—Panicles of relatively self-fertile plants of smooth brome grass were emasculated completely by immersion in hot water, which gave the more consistent results, or by subjection to hot air. Hot-water treatments between 45° and 49° C. on more than 40 panicles a few days before normal anthesis decreased selfed seed set to less than 1 seed per panicle and permitted an average production of 52 seeds per panicle exposed to atmospheric pollen. Bulk pollen transfers, made to unemasculated panicles by bag transfer, isolation of panicles of male and female parents together, enclosure of severed panicles of male parent in the isolation bag of the female parent, and air currents over either severed panicles or intact stems of the male parent, produced significant amounts of hybrid seed. Bulk pollen collected from the male parent at anthesis and applied to panicles of the female parent with an atomizer did not produce much hybrid seed. Under conditions in isolation bags at time of normal anthesis in the field, pollen lost much viability within 24 hr. after shedding. Collected in bulk under atmospheric conditions, it quickly formed large aggregates.

A method of measuring the strength of attachment of cotton fibers to the seed and some results of its application, W. S. SMITH and N. L. PEARSON (*U. S. Dept. Agr., Agr. Market. Serv. and Bur. Plant Indus., 1941, pp. [28]*,

figs. 5).—A simple instrument of the pendulum type and appropriate technic were developed for measuring the force required to detach single fibers from the cottonseed. With it a skillful operator could attain the same accuracy as with a McKenzie single-fiber tester, which was found too time-consuming. When tufts of fibers were pulled from the seed by an apparatus for testing single strands of yarn, figures calculated to represent strength of fiber attachment to the seed for the cotton as a whole, for individual seeds, and for fibers at different positions on the seed were smaller than figures representing the mean strength of fiber attachment obtained by testing individual fibers and are not considered to be accurate enough for fundamental studies.

The strength of attachment of fibers on any given area of any particular seed varied from about 0.25 to about 5.5 gm. The mean strength of fiber attachment varied from area to area on the seed. Fibers on the rounded (chalazal) end of the seed had the lowest strength of attachment and those on the pointed end the highest. A sample of 256 fibers on the side of a seed about half-way between the ends was considered a representative sample for a seed. For comparing 2 cottons, at least 10 or preferably 16 seeds, 1 from each of 10 or 16 bolls representing each cotton, are needed. Each seed is taken from the middle of the lock selected to represent the boll. Comparative tests of 41 selected cottons of different varieties and covering a wide range of seed-cotton characteristics showed that very significant differences exist between different varieties. Significant differences were apparent for cottons of the same staple length.

Domestic flax: A report on its preparation and mill processing, H. BUNGER, J. L. TAYLOR, and C. A. JONES (*Cotton, 105 (1941), No. 12, pp. 82-85, 126, figs. 8).*—Studies at the Georgia Engineering Experiment Station on adaptability of flax to the soil and climate of the South and the processing of flax straw into a fiber suitable for use on cotton mill equipment and for blending with cotton in textile products are reported. The Georgia Agricultural Experiment Station and the Tennessee Valley Authority were other participants in the flax program.

A pilot plant was constructed which could produce from 10 to 15 lb. of fiber an hour. All flax yarns could be spun on cotton equipment and woven into a fabric if the quality was good enough for cotton mill processing, but the quality of the fiber thus far produced in the pilot plant from retted or unretted flax straw was not suitable for practical spinning of 100-percent flax yarn on cotton equipment. Flax fiber might be blended with cotton and other fibers.

The comparative winter hardiness of oat varieties, F. A. COFFMAN (*U. S. Dept. Agr. Cir. 622 (1941), pp. 35, figs. 4).*—The uniform winter-hardiness nurseries of oat varieties, grown for 1 yr. or longer at each of 32 stations in the southern winter oats areas, 1927-36, included many varieties and a wide range of soil and climatic conditions. Differential killing occurred in 138 of 179 station years for which data were accumulated. In other cases complete or no killing occurred.

Hairy Culberson (C. I. 2505) survived best, on the average, and was followed by Bicknell, Culberson (C. I. 273), and Fulghum (winter type, C. I. 2499). Two typical strains of Winter Turf, formerly considered the hardiest winter oats, ranked fifth and seventh of 12 varieties grown in all tests. All the 4 hardy varieties surviving best probably resulted from hybrids between *Avena sativa* and *A. byzantina*. Markton, a nonhardy spring oats, when crossed with Red Rustproof produced hybrids harder than Red Rustproof, although less hardy than certain other oats. Fulghum (winter type, Tennessee selection 090, C. I. 3175), tested for only a short period, appeared to be exceptionally hardy.

In the region in which winter oats are grown, killing in the nurseries was not of consequence in the mildest southern zone, where the average minimum winter temperature was 20° F. or above, seldom was serious in the 20° to 10° minimum temperature zone, often occurred in the 10° to 0° zone, and usually was severe and often complete in the northern zone, where the minimum temperature averaged 0° or below. Only the hardiest varieties could be expected to survive where the minimum winter temperature averages below 0°. Little information was provided on relative hardiness of varieties in the southernmost zone, where survival usually was complete, or in the northern zone, where all sorts often were killed.

The ranking of the oats varieties in hardiness at different stations and in different years was rather similar. In general, at corresponding absolute minimum temperatures, killing increased as the soils became progressively heavier. Killing was infrequent on any soil type when air temperatures remained above 15°, while below -5°, in the absence of snow covering, killing was usually severe or complete. No relation between winter survival and altitude was evident, except as altitude is related to temperature. Winter-killing appeared to be severer west of the Mississippi River than under comparable temperature conditions in the East.

Potato breeding, genetics, and cytology: Review of literature, 1940, F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour.*, 18 (1941), No. 11, pp. 317-329).—The review covers 39 titles published 1938-40.

Influence of sprouts on plant emergence, growth, tuber-development, and yield of potatoes, E. N. McCUBBIN. (Cornell Univ.). (*Amer. Potato Jour.*, 18 (1941), No. 6, pp. 163-174, figs. 3).—Plants of sprouted tubers of a strain of Smooth Rural potatoes came up first, desprouted tubers next, and dormant tubers last. Subsequent plant growth as measured by increase in plant height, blooming, time of tuber set, increase in weight of tubers, and time of maturity was in the order of emergence. The most stems per seed tuber were produced by desprouted tubers due to the desprouting operation. Sprouted tubers produced more stems per seed tuber than dormant tubers because of storage at the higher temperature. The most tubers per plant were produced by seed which had the most stems per plant. The final yield in weight of tubers from sprouted, desprouted, and dormant seed evidently would depend primarily on time of planting, length of growing season, and climatic conditions. With early planting, or a season long enough to permit plants to attain complete maturity, yields would no doubt be equal, while with late planting or a short growing season, in which the plants of all treatments were killed by frost before maturing, yields would probably be highest from sprouted and lowest from dormant seed. The relative response of the three types of seed was the same whether stored in light or in dark for 1 mo. before planting. Delay in emergence, subsequent growth, and maturity resulting from removal of short sprouts compared with no removal was caused by loss of the sprout as a plant part rather than to loss of food reserves or growth substances it contained.

A test of the possibilities of photoperiodic induction of blooming in Triumph potatoes and the morphological consequences, H. O. WERNER. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 5, pp. 144-149).—When early-strain Triumph potato plants were variously subjected to an 8-hr. photoperiod for from 1 to 5 weeks during the first 5 weeks after emergence and a 16-hr. photoperiod with supplemental light used at all other times, indications were that a long photoperiod of bright light is needed for longer than an induction period to obtain flowers and berries. Small vines and low yields of tubers followed use of short days during the first few weeks.

Effect on berry production of varied day length during the life of two Triumph potato strains, H. O. WERNER. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 6, pp. 174-178).—Plants of the Triumph potato strain intermediate in maturity grown during the winter with a 24-hr. photoperiod, with supplemental light of 200-250-footcandle intensity, bloomed and produced seed satisfactorily only if the long photoperiod was used for the first 60 or 70 days after plant emergence. Fewer berries were produced with an 18-hr. photoperiod. Long photoperiods for the initial 20-50 days, however, resulted in meager blooming. The earliest maturing strain produced fewer berries and only when the 24-hr. photoperiod was used for 40 days or longer before blooming.

The influence of fertilizers on potato tuber shape, K. C. WESTOVER. (W. Va. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 6, pp. 155-163).—Measurements of lengths and widths of Cobbler potatoes grown at Lakin, W. Va., 1933, 1936, and 1939 on Wheeling fine sandy loam variously fertilized, revealed that N and P affected length most and that K had little effect under unfavorable conditions but contributed more to width under favorable circumstances.

Fertilizers for Oklahoma potatoes, E. F. BURK (*Oklahoma Sta. Bul.* 249 (1941), pp. 42, figs. 8).—Experiments concerned with formulas and rates of fertilizers for potatoes were conducted from 1 to 5 yr. in eight localities, 1930-37. Results in general suggested a 4-12-4 mixture on the heavier soil types and a 6-12-6 on the lighter ones applied at acre rates of from 400 to 600 lb. As a rule, lighter applications of fertilizer usually should be made in the western and central parts of Oklahoma and heavier applications in the eastern section. The use of more K than N in the mixture was not indicated, although in general the sandier the soil the greater the need for N, and the greater the percentage of clay in the soil the less the need for K. The tests reported were in agreement with those at other stations which have shown a close relationship to exist between the amount and distribution of rainfall and responses of potatoes to N, P, and K, and that the amount and distribution of rainfall are important factors in determining both grade and total yield.

Besides recommendations of formulas and rates for different soil types, comments are made on factors affecting use of fertilizers, i. e., moisture supply, green manures, and organic v. inorganic N sources; relation between yield increase and grade; response of the crop to different nutrients; and suggestions on buying fertilizers.

Growth habits of reed canary grass, M. W. EVANS and J. E. ELY. (U. S. D. A. coop. Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 11, pp. 1017-1027, figs. 3).—The underground rooting stems or rhizomes of reed canary grass (*Phalaris arundinacea*) originate chiefly during May, June, July, and August. Above-ground shoots develop in largest numbers during fall and early spring. In the latitude of northern Ohio culms, with their elongated internodes, begin to form about April 15. Shoots which begin growth in the spring and summer are not winter hardy and their life is limited to the same season. The life of a shoot which develops in the fall is limited to the growing season of the following year. In the latitude of northern Ohio, inflorescences begin to develop from the growing points of the shoots about April 15, flowering begins in early June, and seeds mature in late June and early July. Flowering and maturing gradually progress from just below the tip of the inflorescence toward its base. The leaves of reed canary grass are destroyed by temperatures not low enough to destroy the leaves of timothy, reedtop, Kentucky bluegrass, and some other northern meadow and pasture grasses.

This year's experiments with mechanical thinning of sugar beets show progress, E. M. MERVINE. (Coop. U. S. D. A.). (*Colo. Farm Bul.* [Colorado

Sta.], 3 (1941), No. 4, pp. 6-8, fig. 1).—Yields of sugar beets mechanically thinned by a tractor-drawn thinning tool, supplemented by laborers using long-handled hoes, did not differ much from yields in a hand-thinned field, and the labor time was cut about in half and stoop labor eliminated. Development of the single-seed ball planter resulted in an improved type of planting with consequent increase in number of single beet plants and appreciable saving in seed. Results with this planter were still further improved when small seed were used.

Management of sweet clover in a pasture system, C. A. HELM (*Missouri Sta. Cir. 215* (1941), pp. 10, figs. 2).—Sweetclover has an important place in the seasonal succession of Missouri pasture crops. Second-year sweetclover equals or surpasses all other crops for spring pasture, and first-year sweetclover, correctly managed, provides good pasture from October to December. The combined use of sweetclover and Korean lespedeza furnishes highly productive legume pastures in spring, summer, and fall. Practical information is given on the growth habits and soil requirements of sweetclover and on its cultural and grazing management in various combinations and sequences. Returns from good management of sweetclover and Korean lespedeza in combination to produce an all-season legume pasture are illustrated in results obtained, 1938-41, near Paris, Mo.

La batata como cultivo sucesivo al algodón [The sweetpotato as a crop to follow cotton], E. MOLINAR Y SALÉS (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 5, p. 6, fig. 1).—The sweetpotato, especially the Don Juan variety, is indicated as a good crop to follow sea-island cotton because of rapid growth and response to fertilizer residues left by the cotton. Since the sweetpotato belongs to a family unrelated to cotton, it would not be liable to introduce certain insects and diseases into the rotation.

Birdsfoot trefoil and big trefoil, R. MCKEE and H. A. SCHOTH. (Coop. Oreg. Expt. Sta.). (*U. S. Dept. Agr. Cir. 625* (1941), pp. 14, figs. 4).—The general characteristics of birdsfoot trefoil (*Lotus corniculatus*) and big trefoil (*L. uliginosus*) and their soil and climatic requirements are described. Comments are made on forage and pasture value, seed, and insect pests, and practices are indicated for growing and harvesting the crop for forage and seed. Descriptions and keys give the specific characters that separate species, varieties, and forms and indicate the range of variation. The limited experience with both plants in the United States follows the pattern of experience in Europe, Australia, and New Zealand, indicating that these plants are adapted to at least limited sections and usable for forage and pasturage.

Protein surveys of American hard spring and soft winter wheats, C. H. BAILEY (*Minnesota Sta. Tech. Bul. 147* (1941), pp. [1]+46, figs. 25).—The distribution curves of protein content of 14 crops of hard spring wheat marketed through Minneapolis from 1925-26 to 1938-39 showed that, in general, protein content tends to increase in progressing from east to west in the spring wheat area, although not in all seasons. Variability in protein content of spring wheat was not uniform from season to season. As measured as standard deviation, it was greatest in 1935 and 1936, the seasons of highest average protein content, and lowest in 1927 and 1928, seasons of the lowest protein content. Although rainfall appeared prominent among climatic factors influencing the protein content of a crop, correlation between rainfall and average protein content was not perfect, since there was a carry-over of the effect of previous seasons. Dark northern spring wheat had a higher average protein content than northern spring in the seasons 1933-36, when subclass comparisons were made.

The variability of individual shipments from a single shipping point was measured, and the standard deviation of the coefficient of variation of an aver-

age of 161 shipping points per season for four seasons was 1.14, i. e., chances are even that a single shipment would fall within ± 1.14 percent of the average protein content for the station. Protein premiums appeared to be a function of the percentage of the crop which contained more than 13 percent of protein. The relation between these two variables is expressed graphically as an exponential curve, resolvable into a straight line by using the equation $\log(y-c)=x$, in which y equals percentage of crop containing more than 13 percent protein, x equals protein premium in cents per bushel per 1 percent protein, and c equals a constant, which proved to be 4.

Soft red winter and white wheats, grown chiefly in Illinois, Indiana, Ohio, and Michigan during the crop seasons of 1931-32 to 1937-38, contained a lower average percentage of protein than the hard spring wheats harvested during the same seasons. Variability in the protein content of the samples of soft red winter wheat was only about half as great as that among hard spring wheats.

Brief reviews of research on the influence of environment on the composition of wheat and of the relationships between kernel texture and protein content are included.

Proceedings of the Association of Official Seed Analysts of North America, 1940 (*Assoc. Off. Seed Anal. North Amer. Proc.*, 32 (1940), pp. 105+[2], figs. 19).—Papers presented at the thirty-second annual meeting at Auburn, Ala., June 18-21, 1940, included The Viability of Injured Weed Seeds (pp. 31-42)—The Plant Producing Value of Injured Seeds of *Rumex* spp., by L. A. Kanipe (pp. 32-39) (Oreg. Expt. Sta.), Summary Report of Three Years Work, by V. J. Thompson (pp. 40-41) (Iowa Sta.), and *Ambrosia artemisiifolia* and *Setaria viridis*, by A. C. Heise (pp. 41-42); The Iowa Experimental Method for Purity Analysis of *Chalcis*-Fly Infested Red Clover and Alfalfa Seeds, by W. A. Robbins (pp. 46-49), and Our Responsibilities as an Association, by R. H. Porter (pp. 62-69) (both Iowa Sta.); Some Problems in the Analysis of *Chalcis*-Fly Infested Red Clover and Alfalfa Seed, by P. Hayes (pp. 49-52), and Separation of Immature Seeds of *Trifolium repens*—White Clover, and *Trifolium hybridum*—Alsike Clover, by M. Weisner (pp. 103-105) (both Oreg. Sta.); Proposed Changes in the Rules and Recommendations for Testing Seeds as Regards the Disposition of Insect-Damaged Seeds, by J. S. Jones (pp. 52-54); Reactions to the Federal Seed Act and Some Observations for the Improvement of Seed Conditions in the South, by R. E. Lambert (pp. 70-73); Increasing and Renewing Seed Stocks in One-Variety Cotton Communities, by R. R. Childs (pp. 73-75) (Ga. Sta., U. S. D. A., et al.); The Quality of Seed Farmers Grow and Plant—A Seeder Survey, by L. E. Everson (pp. 75-77), A Method for Quickly Determining the Pure Seed Content of Bluegrasses, by B. Cullinan (pp. 81-83), Influence of Phytohormones on Germination and Growth of Cereals, by W. Crosier, S. Patrick, and D. Weimer (pp. 83-86), Response of Germinants From Beans, Corn, and Peas to Seed Treatments With Hormones and Mercurials, by W. Crosier and C. E. Heit (pp. 88-92), and Do We Need Flower Seed Germination Standards? by M. T. Munn (pp. 102-103) (all N. Y. State Sta.); An Experiment in Mixing and Sampling Kentucky Bluegrass, by W. A. Price and E. C. Vaughn (pp. 77-80) (Univ. Ky.); The Evaluation of Hard Seed in Annual Lespedezas When the Germination Test Is Made Soon After Harvest, by J. W. Woodside (pp. 86-88); and The Effect of Light and Temperature on the Dormancy of Scotch Pine Seed, by E. J. Eliason and C. E. Heit (pp. 92-102) (N. Y. State Sta. et al.).

Technical problems were also considered in committee reports.

[Seed and inoculant research] (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 1-2, 4-5, 8, 15, figs. 2).—Legume Inoculant Tests for 1941, by A. W. Hofer (pp. 1, 15), discusses and tabulates results of tests of 64 commercial

legume inoculants on sale in New York. Control Field Plantings Verify Variety Names (p. 2) reports on variations in trueness to type and variety in 329 samples of field crop seed, 509 of vegetable, and 63 samples of flower seed tested in control fields. Seed Testing Combines Both Service and Research (pp. 4-5) reviews the activities of the seed testing laboratory during 1940-41. The decided superiority of the wild white or permanent pasture types of white clover is noted briefly.

Farmstead weeds, A. H. LARSON, L. ERICKSON, and R. B. HARVEY. (Minn. Expt. Sta.). (*Seed Trade Buyers Guide*, 24 (1941), pp. 65-70, 73-82, figs. 15).—Popular descriptions with illustrations and control methods are given for common farm weeds.

Representative Missouri weeds and their control, W. B. DREW and C. A. HELM (*Missouri Sta. Bul.* 433 (1941), pp. 211+[5], figs. 89).—A practical manual discussing in nontechnical terms the economic importance of weeds and methods for their control, and providing determinative keys for the principal groups and for individual weeds and descriptions, including distribution and control methods of representative weeds. A brief glossary and indexes to common and scientific names are included.

Weeds of New Jersey, J. G. FISKE (*New Jersey Stat. Cir.* 416 (1941), pp. 51, figs. 35).—This revision of Circular 219 (E. S. R., 62, p. 523) is concerned with common, noxious, and lawn weeds and their control by the most recent methods.

Thistles, wormwoods, and ragweeds in North Dakota, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 2, pp. 10-12, figs. 3).—The occurrence, and in certain cases the economic importance, of true thistle (*Cirsium* spp.) and related plants, wormwoods (*Artemisia* spp.), and ragweeds (*Ambrosia* spp.) in North Dakota are described briefly.

HORTICULTURE

[**Horticultural studies by the Alabama Station**] (*Alabama Sta. Rpt.* 1940, pp. 32-39, 40-41).—Information is presented on the progress of the following investigations: Comparative cold resistance of several cabbage, collard, and English pea varieties in the field during the winter of 1939-40 and a comparison of outstanding lines of pole snap beans developed by the station and of several commercial varieties, both by F. E. Johnstone, Jr.; the influence of several plant hormones on the rooting of some ornamental plants, by E. W. McElwee; and the possibilities of devil's shoestring (*Tephrosia virginiana*) as a hillculture crop, by O. A. Atkins.

[**Horticultural studies by the Colorado Station**] (*Colorado Sta. Rpt.* 1941, pp. 31, 32-33).—Brief statements are presented on the progress of investigations in onion breeding and fertilization, fertilization and mulching of sour cherries, variety tests of fruits, factors involved in winter injury on raspberries, and the nutritional requirements of the carnation.

Propagation of plants, L. R. BRYANT and G. BEACH (*Colorado Sta. Bul.* 468 (1941), pp. 26, figs. 10).—This general bulletin discusses the technics of increasing plants by means of seed and by the use of vegetative portions, such as scions, buds, cuttings, layers, tubers, bulbs, corms, divisions of the crown, etc. The use of growth-promoting substances is considered, and the tools and materials required in grafting and budding operations are described.

Effects of synthetic growth substances on transplants, J. C. SWARTLEY. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 357-360).—Treatments with synthetic growth substances stimulated root and stem development in woody plants, such as crabapples and Pfitzer juniper; in perennials,

such as coreopsis; and in annuals, such as the tomato and aster. Talc mixtures of certain growth substances applied to the moistened roots of small trees caused the development of abnormal clusters of branch roots. The watering of grafted stocks with solutions of synthetic substances resulted in increased survival and more rapid development of absorption roots, particularly in red cedar.

Grouping of strains or varieties by use of a Latin square, W. D. BATEN, J. I. NORTHAM, and A. F. YEAGER. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 616-622).—This paper describes a lay-out of 64 strains of tomatoes in groups of 16, planted in a 4 x 4 Latin square, and contains statistical analyses pertaining to the yields of these strains. Technics are presented for arriving at valid experimental errors when certain error variances are heterogeneous, and tests are given for comparing the mean of groups, the means of strains within a group, and the means of strains in different groups. A statistical analysis is given when estimates are made for certain extraordinary plant yields.

"Starter" solutions in the production of cauliflower and brussels sprouts on Long Island, W. C. JACOB and R. H. WHITE-STEVENS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 349-350).—None of eight starter solutions, supplied at the time of setting at the rate of about 1 pt. per plant to cauliflower grown on an area receiving 1 ton of 4-8-6 fertilizer per acre plus a side dressing of 125 lb. of nitrate of soda, exceeded water in value. In another trial with cauliflower and brussels sprouts, also on a heavily fertilized soil, no benefit was obtained from starter solutions with or without added growth-promoting substances, such as indoleacetic acid. Any response that attained significance was in a harmful direction. It is suggested that the high level of fertility under which the crops were grown may have been a factor in the results.

Studies of the response of lettuce to manure and commercial fertilizers, A. E. GRIFFITHS. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 351-356, fig. 1).—Of various fertilizers applied in bands at the time of setting lettuce (September 12) on an area given 10 tons per acre of partially decomposed manure before planting, ammonium phosphate (11-48) gave the highest yields. On the same soil without manure, the highest yields were obtained from an experimental mixture of approximately 9-26 analysis, with one-fourth of the N from blood meal. In general, simple inorganic materials gave the best results on the manured soil and fertilizers with a part of the N from organic sources on the unmanured soil. The manure resulted in more rapid growth, earlier maturity, and a more succulent plant. In general, lettuce from manured plats contained more N and P at harvest than that from nonmanured plats. Water penetration into the soil was more rapid and uniform and soil moisture was higher preceding irrigation on the manured areas.

Quality of muskmelons as related to condition of plants, J. D. HARTMAN and F. C. GAYLORD. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 341-345).—Available leaf area and freedom of leaves from disease had an important effect on soluble solids content and quality of ripe melons. Refractive indices, as determined by the Abbe apparatus in 1939 and the Zeiss in 1940, were useful indicators of quality, but were not closely enough correlated with taste to be used blindly as measures of edible quality. In 1939 the simple correlation coefficient for the taste estimate and soluble solids was 0.62 ± 0.02 and in 1940, 0.53 ± 0.02 . Other factors, especially the amount of aromatic substances, may influence edibility ratings. Variations in ripeness among melons picked supposedly when fully ripe may affect soluble solids content.

A study of natural crossing in peppers (*Capsicum frutescens*), M. L. ODLAND and A. M. PORTER. (Univ. Conn.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 585-588).—Interplantings of varieties with contrasting characters, such as fruit color or shape, showed considerable natural crossing in the cultivated pepper. The amount of intercrossing varied with varieties, and there was as much crossing between varieties of different groups as among varieties of a single group. No variety was entirely self-fertilized. The honeybee was observed on pepper flowers and is believed to be largely responsible for cross-pollination. Wind may carry pollen to nearby plants, but it is thought to cause little, if any, of the crossing observed.

Comparative earliness and productiveness of first and second generation summer squash (*Cucurbita pepo*) and the possibilities of using the second generation seed for commercial planting, L. C. CURTIS. (Conn. [New Haven] Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 596-598).—Continuing the earlier-noted study (E. S. R., 84, p. 187), in 1940 Early Prolific Straight Neck, Connecticut Straight Neck No. 10, and the F_1 and F_2 from a cross of the two were compared in a Latin-square design as to earliness and yield. Neither total yield nor early yield was reduced materially in the F_2 generation. The F_2 would have the material advantage of reduced cost of seed production since no emasculation or hand-pollination would be required. Since summer squash is harvested in an immature state, variability in size and form is minimized in importance. A possible further advantage for the F_2 was that segregation for earliness resulted in 2.4 percent of the plants producing female flowers 2 days before such appeared in the F_1 generation.

Some new sweet corn varieties for New York growers, W. D. ENZIE (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 7, 9).—Information is presented on yields, days to maturity, average length of ears, number of rows of kernels per ear, and percentage of usable raw product for five yellow and six white hybrids. Allegheny, a yellow hybrid sweet corn, yielded at the rate of 7.98 tons per acre in 1941, but was inferior to Golden Cross in sweetness and flavor.

A preliminary report on two plants versus one tomato plant per stake, E. P. BRASHER. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 329-331).—Break o'Day tomato plants were grown one and two per stake set 2 ft. apart in rows 4 ft. apart. The yield of early marketable fruit was 8.84 tons per acre for the two and 6.48 tons for the single plants. Total yields were 15.58 and 10.68 tons, respectively. The size of fruits was slightly larger on the single plants but not enough to offset the additional numbers on the double plants. In a variety such as Break o'Day, the increased foliage of the double plantings is conceded of potential value in protecting fruits from sunscald.

The efficient use of nitrogen in tomato culture, J. B. HESTER (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 308-312).—That large contents of nitrogen in the commercial fertilizer mixed in the row prior to planting may not only be ineffective but actually decrease yields of tomatoes was indicated in experiments in New Jersey and Pennsylvania in 1939 and 1940. Evidence was obtained that on Sassafras soil the application of nutrient materials as side dressings about 2 and 7 weeks after planting was an efficient method. Tomatoes fertilized in the row prior to planting appeared to be overvegetative, and the amount of nitrogen in the leaves supported this observation. In the case of tomatoes supplied with superphosphate and side dressed with different materials, cyanamide broadcast at the rates of 100, 200, 400, and 600 lb. prior to planting had no benefit on Sassafras sandy loam. On the Collington fine

sand 200 lb. of cyanamide gave the largest increase in yield. Studies of the effect of applied nitrogen on the quality of tomatoes showed no significant difference except a slight increase in the nitrogen content of the fruit.

A 5-year yield record of tomato varieties for canning, W. T. TAPLEY (*Farm Res. [New York State Sta.], 8 (1942), No. 1, pp. 3, 12*).—Data are presented on the total, early season, midseason, and late season yields of nine varieties or strains of tomatoes which thrived well in western and up-State New York. The total yields, averaged for the 1937–41 period, ranged from 13.82 tons per acre for Stokesdale to 10.17 tons for Marglobe. Geneva John Baer led in early yields but was closely followed by Stokesdale.

Relation between soil organic matter and available moisture under different orchard cultural systems, L. HAVIS. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 32–36*).—Studies of soil samples collected in July and August from sod, mulch, and cultivation plats in a 25-year-old apple orchard showed considerably less organic matter under cultivation, even though cover crops had been grown. In one location the mulch and sod samples were about equal in organic matter, and in another the mulch was significantly higher than the sod. The moisture equivalents increased with the organic matter percentage at each location, and the mean wilting percentages varied directly with organic matter although not significantly in all instances. Available moisture percentage computed by determining the difference between wilting percentage and the moisture equivalent was higher under mulch and sod than under cultivation. The differences in organic matter due to cultural treatments resulted in significant differences in available moisture.

The first twenty years results in a Michigan apple orchard: Cultivation-covercrop vs. sod-mulch culture, W. TOENJES (*Michigan Sta. Spec. Bul. 313 (1941), pp. 18, figs. 5*).—In an orchard established at the Graham Horticultural Substation near Grand Rapids in 1919, one-half of the trees were maintained under the cultivation-cover crop system and the other half under clover sod-straw mulch. However, the clover was soon crowded out by bluegrass, which was mowed and placed under the trees. Additional materials, such as straw, damaged hay, and weeds, were added to the mulch from time to time. Nitrogen fertilizers were applied annually in equal amounts to both areas.

During the first 10-yr. period the trees under clean culture made the larger trunk growth and produced more fruit per acre, but at the close of 20 yr. the trees in sod-mulch were larger and had produced the greater acre yields. The fruit from the mulched trees had slightly more color and graded out approximately 79 percent more grade A-sized apples than did fruit from the tilled areas. The annual acre cost of maintenance was about the same, being slightly less for the sod-mulch treatment. The soft, spongy nature of the mulch reduced the damage to dropped apples, but mulches provided winter quarters for mice and increased the hazard of girdling injury. Fire was also a greater menace in the mulched area. Clean cultivation favored erosion with exposure of roots to cultivation and low-temperature injury. During a dry period in late summer there was much more moisture in the soil beneath mulch than beneath cultivation-cover crops. The author suggests that the change from cultivation-cover crop system to mulching might be made at an earlier stage than is usually practiced. The type of procedure will vary with soil fertility, depth of soil, and slope in the orchard.

The effect of soil-management methods on certain physical and chemical properties in relation to the infiltration rates in West Virginia orchards, R. H. SUDDS and G. M. BROWNING. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 38–46, fig. 1*).—Observations on a

total of 63 profile samples taken from 20 commercial orchards showed that cultivation as compared with an undisturbed sod cover had reduced the organic matter content, the percentage of the larger aggregates, the noncapillary porosity, and the infiltration rates, but had increased the volume weight and the dispersion ratio. Straw mulch, by protecting the surface from the dispersing action of the water from the infiltrometer nozzles, materially increased the infiltration rate over that of tilled areas. The importance of protecting the surface with vegetation or ample mulches was indicated. Orchards in sod continuously maintained favorable structural conditions unless compacted mechanically.

The correlation of trunk circumference with weight of top in some double-worked apple trees, F. N. HEWETSON. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 233-236).—"A group of Steele trees were cut off at the union of scion and interstock, or scion and seedling, according to the build-up of the tree, and the tops weighed. The weights of these tops were then correlated with the trunk circumferences and areas of trunk cross section. The coefficients of correlation were, respectively, 0.910 ± 0.018 and 0.921 ± 0.016 . By means of a regression equation based on all the trees in this experiment, it was possible to estimate weight of top from trunk circumference measurements to within 16 percent."

Apple varieties and important producing sections of the United States, J. R. MAGNESS (*U. S. Dept. Agr., Farmers' Bul. 1883* (1941), pp. 11+32, figs. 5).—The development of the apple industry in the United States is traced, with information on the present distribution, numbers of trees, and production, together with specific information as to the important climatic and topographic features of the main apple sections. The insect and disease problems in the various areas are discussed, and the characteristics of the leading varieties of apples grown are described. Some consideration is given to color strains.

Leaf analysis and apparent response to potassium in some prune and apple orchards.—Preliminary report, D. BOYNTON, W. REUTHER, and J. C. CAIN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 17-20, figs. 2).—Studies in four prune and two apple orchards, the trees of which were initially low in K and showed varying degrees of leaf scorch, indicated that applications of K salts and of heavy manure mulches tended to decrease scorch and to increase the percentage of K in the leaves. The increase in K content was proportional to the amount of K applied to the soil. The only instance of a complete disappearance of scorch was in the case of 6-yr. Italian prunes receiving both manure and K salts. It is suggested that there may be a lag in the effectiveness of the K, due perhaps to internal conditions in the tree. The normal K content of prune leaves was apparently above that of apple leaves, and deficiency symptoms were evident in the prune at a higher K level.

The nitrogen, phosphorus, and potassium content of peach leaves as influenced by soil treatments, J. G. WAUGH and F. P. CULLINAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 13-16).—Samples of leaves collected from Elberta trees in their ninth season in an orchard located on Sassafras gravelly loam and fertilized in April with potassium nitrate were found in most cases to have twice the K content of leaves from trees receiving an equivalent amount of N but no K. The leaves of K-deficient trees were smaller and slightly lighter in color. P and N values showed no marked difference between plats and no significant relation to K. Growth records indicated that trees supplied adequately with K had a much greater leaf area, made greater total growth, and formed more blossom buds per linear

foot of shoots. When certain 8- and 4-year-old trees were supplied with potassium sulfate on May 10 and June 12, respectively, by the end of July both lots of trees had three times and by September 3 four times as much K as did the controls.

Certain factors influencing the size of dried prunes, A. H. HENDRICKSON and F. J. VEIHMAYER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 80-85, fig. 1).—Over an 8-yr. period, French prune trees at Davis, Calif., produced approximately equal percentages of medium-sized dried prunes whether irrigated or not. The weights of small-sized prunes increased with the numbers of prunes on the trees in both the irrigated and dry plats. The weights of small sizes in the dry plats were further increased by the lack of readily available soil moisture during the growing season. The weights of medium-sized prunes in the irrigated plats increased also with the numbers of fruits on the trees. On the other hand, the weights of large prunes in the irrigated plats did not show a close or consistent relationship with the numbers of fruits on the trees. With prune trees which did not suffer for water during the growing season, the weights of the various sizes of dried fruits were largely determined by the amount of crop. A lack of available moisture during the growing season increased the weights of the small sizes, decreased the weights of large sizes, but had little effect on the weights of medium sizes.

Fruit pressure testers and their practical applications, M. H. HALLER (*U. S. Dept. Agr. Cir. 627* (1941), pp. 22, figs. 2).—The construction and operation of various types of fruit pressure testers, designed to measure the firmness of fruit, are described. With advancing maturity, there is a decrease in firmness, but various factors such as temperature, moisture content of the fruit, methods of soil fertilization, soil moisture, fruit thinning, and rootstocks may influence the readings. Pressure tests offer a fairly accurate guide to ripeness of apples, particularly for indicating when fruit are becoming too soft and overmature for storage. Data are presented on the pressure-test range, representing different degrees of ripeness of a number of important apple varieties. With pears, the pressure test was found of primary importance for establishing picking maturity standards, and such standards are presented for a number of varieties. The pressure test has not proved as satisfactory as a measure of ripeness of pears during cold storage. With peaches and plums the test may be used to establish color standards for picking.

Influence of spacing on yield and grade of strawberries, E. P. CHRISTOPHER (*Rhode Island Sta. Bul. 283* (1941), pp. 15, figs. 4).—Two spacing experiments were conducted, one beginning in 1936 and the other in 1937. Two varieties were used, Howard 17 and Dorsett. There was a total of 14 treatments, including mother plants set 18, 24, 30, and 36 in. apart in rows 3 ft. apart and runner plants ranging from matted rows with no limitations to five per mother plant. Under favorable growing conditions without runner control, both varieties tended to produce excessive numbers of runner plants. Spacing runner plants 5 to 7 in. apart resulted in the highest yields. Beyond 8 in., yields were reduced. Runner plants developed more and larger leaves as the distance between them was increased. The early-developing runners attained the largest size. Spacing did not materially increase the number of large berries, except as it increased total yields. Under moist, foggy conditions Howard 17 berries rotted more quickly than did Dorsett berries. For Rhode Island, it is concluded that mother plants should be spaced 18 to 24 in., with the runners about 6 in. apart.

Relationship of width of thinned row to productiveness and quality in the Blakemore strawberry, J. C. CRANE and I. C. HAUT. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 417-419).—Blakemore plants grown

in rows 10, 20, 30, and 40 in. apart with much the same spacing, 4 to 6 in., in the row yielded 15,635, 13,997, 12,418, and 10,632 qt. per acre. The percentage of U. S. No. 1 berries was about the same in all four arrangements. Despite the fact that the distance between plants was least in the 10-in. rows, these outyielded those in the wider rows on a plant basis. This result was explained by the fact that the 10-in. row included a greater proportion of early-formed and early-established runners, with a higher fruiting capacity.

The pattern of strawberry root development under the matted and thinned row, A. L. SCHRADER. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 413-416, figs. 2).—Studies by the soil-cube method of root distribution of Blakemore strawberry plants grown in matted rows and spaced 7 and 11 in. apart showed in all three cases the largest concentration of roots in the upper 3 in. of soil. The matted-row plants developed more roots, especially in the upper soil layers, than did the spaced plants. The roots of the spaced plants did not occupy fully the entire soil zone between plants but did develop a greater percentage of roots in the lower soil layers than did the matted-row plants. Comparing observations in September and the following April, it was evident that a great increase in root development occurred in this period. More roots developed during this time at deeper depths under the spaced than under matted-row plants. Root concentration under the matted plants may be partially responsible for the smaller fruit size.

Fall setting strawberries in Missouri, A. D. HIBBARD and T. J. TALBERT. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 427-429).—Observations on the growth and development of strawberry plants set out at 15-day intervals, November 1 to December 2 and February 15 to April 15, showed greater runner production in the fall-set plants, and the young plants were larger because of their earlier establishment. Fall-set plants were less influenced by date of setting than were spring-set plants. Aroma plants set on November 15 were much more productive than those set March 15, sufficiently so as to warrant the additional costs incurred through mulching and extra cultivation.

The Rocky Mountain strawberry as a source of hardiness, A. C. HILDBRETH and L. POWERS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 410-412).—Located in a region of extremely low winter temperatures, limited snow cover, and a highly alkaline soil, the Horticultural Field Station at Cheyenne, Wyo., found that the usual commercial strawberry varieties suffered severe injury. Selections of wild strawberries from the Rocky Mountain area were assembled and, although highly variable in plant and fruit characters, tolerance to alkalinity, etc., some showed considerable resistance to drought and all proved winter hardy without protection. Most of the material was apparently of the *Fragaria cuneifolia* type, with some *F. vesca* present. Crosses made between Gem, Dorsett, and Fairfax and selections of *F. cuneifolia* yielded F₁ plants which in general were superior to the horticultural parents in winter hardiness. The F₁ plants and their native parents were in general better plant makers than the horticultural parents. There was a great range in fruit size from that of the native parent to approximate Fairfax size. Seedlings with Fairfax and Dorsett parents were superior in flavor and sweetness to Gem seedlings. One seedling with Fairfax parentage produced highly aromatic, superior-flavored fruit. There was some variation in the time of flowering and fruit maturity. In a few cases F₁ plants bloomed and ripened fruits earlier than either parent. Both spring fruiting and everbearers were obtained in all three crosses. The F₁ hybrids set seed readily when selfed, backcrossed to either parent, or crossed with other F₁ seedlings.

Commercial strawberry culture in Missouri, T. J. TALBERT and A. D. HIBBARD (*Missouri Sta. Cir. 216 (1941), pp. 24, figs. 10*).—General information is offered on the selection of sites, preparation of soil, rotations, varieties, planting, culture, fertilization, mulching, harvesting, marketing, control of insect and disease pests, etc.

The rooting response of various species of *Rubus* to conventional methods of propagation, L. E. JOLEY and A. W. CLOSE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 420-423).—Information is presented on the results of propagation trials with a considerable number of *Rubus* species obtained from Europe and Asia. It was evident that raspberry species which propagate from suckers propagate poorly, if at all, from the canes. In limited trials with root-inducing substances, the greatest stimulation was obtained in those species that root without treatment. Applied as a dust in talc, indolebutyric acid increased rooting in a few instances and was harmful in others. A 1 : 1,000 dust of 3 parts of naphthaleneacetic acid plus 1 part each of thiourea and nicotinic acid increased rooting of one species and had no effect in another. Information is given on seed germination of certain species.

Breeding autumn-fruiting raspberries under Oregon conditions, G. F. WALDO and G. M. DARROW. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 274-278).—At Corvallis, Ore., the cross Lloyd George × Ranere yielded a high percentage of early autumn-fruiting seedlings and the cross Cuthbert × Lloyd George a large percentage of midautumn-fruiting seedlings. The early-maturing autumn-fruiting seedlings of Cuthbert × Lloyd George, although few in number, contained the more promising selections for commercial use. There were so few early fall-fruiting seedlings in the Viking × Lloyd George and Newburgh × Lloyd George crosses as to render these crosses ineffective. Similar observations were made on crosses of Lloyd George × Chief, Latham, Potomac, U. S. No. 231, and Plum Farmer. Selfing a variety was apparently an effective method for determining its value as a source of fall-fruiting seedlings. Lloyd George, the best parent of fall-fruiting seedlings, was most productive of such material when crossed with a variety tending toward fall fruitfulness. There was a tendency for more seedlings of Lloyd George × Ranere to fruit in the autumn in Oregon than in Maryland.

Production, berry size, and growth of red raspberries as influenced by mulching, W. H. CHILDS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 405-409).—Heavy mulching with rye, buckwheat, and wheat straw of Latham, Chief, Viking, and Newburgh red raspberries proved superior to cultivation, whether evaluated by total yields or by wood production. The increase in yields was statistically significant in two cases, doubtfully so in a third, and not significant in others. Wood production, as measured by weight of postharvest pruning, was highly correlated with yield in most instances. In one of the two seasons increased berry size was a factor in increased yields. Mulching delayed ripening slightly and is deemed particularly valuable on soils subject to erosion and where the moisture supply is limited.

Yield, size of berries, and season of maturity of the highbush blueberry as influenced by severity of pruning, W. T. BRIGHTWELL. (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 447-450).—Measurement of blueberries collected from plants pruned to various degrees of severity from none to heavy showed, in general, that the average size of berries increased with the severity of the pruning. Total yields decreased, in general, with severity of pruning, and there was a tendency for the severely pruned plants to mature a larger percentage of their fruits earlier in the season. The amount of rainfall during the growing season modified the effects of pruning. Large laterals

matured their fruits earlier than small laterals, and this fact may explain why the heavily pruned plants tended to ripen more of their crop early.

Leaf characters as a basis for the classification of blueberry varieties, J. H. CLARK. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 441-446, fig. 1).—A device, designated as the New Jersey Blueberry Leaf Gauge, and found useful in the rapid measurement of blueberry leaves, is described. Measurements of leaves before and after drying in a press showed but little change, suggesting that either measurement would be satisfactory in classification. Rubel leaves collected from several parts of the State varied somewhat, yet the measurements were close enough to be of value in classification. A preliminary grouping of blueberry varieties based on leaf characters is presented.

The relationship of different methods of expressing size of blueberry fruits, F. B. CHANDLER. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 279-280, fig. 1).—A study in 1939 and 1940 of the distribution of 11,710 blueberry diameters showed them to form a normal curve. When the data for samples with the same mode were combined and the curves for each group plotted, they were found to be very similar. The correlation coefficient of the mean diameter of all the berries and the diameter of the largest berry was $+0.712 \pm 0.040$. The correlation coefficient of the mean diameter of all the berries and the mean diameter of a 3-percent sample including the largest berries was 0.793 ± 0.030 . When the number of berries per cup and the mean diameter of the berries were plotted, the relationship was curvilinear. When the data were analyzed the correlation index for curvilinear relationship was 0.9997 ± 0.0001 in 1939 and 0.9912 ± 0.003 in 1940. The correlation index for the number of berries per cup and a 3-percent sample including large berries was 0.8816 ± 0.038 .

Studies on the shatter of grapes, with special reference to the use of solutions of naphthalene acetic acid to prevent it, W. T. PENTZER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 397-399).—Clusters of four vinifera varieties of grapes (Sultanina, Flame Tokay, Alphonse Lavallee=Ribier, and Emperor), one labrusca (Pierce), and one muscadine (James) were treated with solutions of naphthaleneacetic acid. Whether applied as a preharvest spray or as a dip to freshly picked grapes, the chemical failed to increase berry adherence in any case. There was a marked natural difference among varieties in the strength of berry attachment. Ribier and Emperor, characterized by tough skin and well-developed pedicels, were three to four times as strongly attached as Sultanina.

The Brunswick (Magnolia) fig, I. J. CONDIT. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 143-146).—Based on a study of the literature and of trees and fruit, the author concludes that the Magnolia fig is identical with the older variety Brunswick.

Interesting minor fruits for New York gardens, G. L. SLATE (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 11-12, fig. 1).—Discussed as to habitat, growth and fruit characters, and horticultural possibilities are the following species: American persimmon, papaw, juneberry, buffaloberry, elderberry, high bush cranberry, Chinese bush or Nanking cherry, and western sand or Bessey cherry.

Periodicity in transpiration of lemon cuttings under constant environmental conditions, J. B. BIALE. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 70-74, figs. 2).—After a preliminary period in a uniform environment, Eureka lemon cuttings with four or five leaves were placed in sealed jars containing nutrient solutions and exposed in a control chamber to 4-hr. photoperiods alternating with 4 hr. of darkness. Measurements of water loss by transpiration showed a pronounced drop during the lighted hours from

midnight to 4 a. m. The maximum transpiration values were obtained for the same period by reversing the preliminary light exposure, that is, providing an artificial day from 8 p. m. to 8 a. m. This inversion was brought about by only 9 days of exposure. The observed periodicity was most pronounced during the first 3 or 4 days following change of conditions.

Effect of planting date on germination of tung nuts in the nursery, S. MERRILL, JR., W. A. SLICK, J. H. PAINTER, and R. T. BROWN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 153-156, figs. 2).—Open-pollinated fruits, saved separately from each of 20 tung trees, were stored as whole fruit in the loft of an unheated garage where the temperature fluctuated widely. A total of 16 plantings was made at intervals from December 5 to July 3, and emergence records were taken beginning May 6. The best results, 72-78 percent, were obtained in the five plantings made between February 20 and April 10. In general, germination fell off rapidly in plantings made later than April 10, and only a few trees large enough for budding or satisfactory transplanting were obtained in plantings made after that date. There was a large difference in the germinating capacity of different lots, due in part to environmental factors and in part to inherent characteristics.

Period of stigma receptivity in flowers of the tung tree, R. T. BROWN and E. FISHER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 164-166).—Controlled pollinations made in a tung orchard near Cairo, Ga., showed that pistillate flowers remained receptive for about 9 days after the corolla had opened. There was a trend for fewer nuts to be produced per flower in pollinations made after the corolla had been open 5 days or longer, but the difference was not significant until the eighth or ninth day. Similar work at Gainesville, Fla., showed similar results. In the Cairo study, no evidence of self-incompatibility was seen in any of the eight trees used.

The growth period in shoots and fruits of mature tung trees, W. W. KILBY and M. D. PARKER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 161-163, figs. 2).—Measurements taken at weekly intervals from April 17 to July 24 on fifteen 7-year-old tung trees in a well-cared-for Mississippi orchard showed shoot elongation to take place in the period April 17 to about July 18. The most rapid growth was recorded between April 26 and June 6. The duration of the growth period was the same for all shoots, irrespective of their ultimate length. Measurements of fruit on the same branches showed that the growth period of the nuts coincided exactly with that of the shoots, the shape of the curve being of the general sigmoid type. There was no period of arrested development.

Preliminary experiments on the resistance of the tung tree to low temperature, D. L. FERNHOLZ and G. F. POTTER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 167-172, fig. 1).—Artificial freezing tests conducted in an insulated chamber capable of producing temperatures down to about -10° F. showed that the tissue of tung trees increased steadily in cold resistance from the time of leaf fall to midwinter. Observations on seven groups of seedlings, each the open-pollinated progeny of a single tree, showed significant differences in the average injury to the seven progenies on different dates, and also that the average injury for all tests was significantly less in certain progenies. Freezing tests of seedlings treated differently with respect to fertilizer gave indications that heavy nitrogen treatment was harmful and that some benefit resulted from phosphorus.

Response of bulbous iris to preplanting treatments, D. V. LUMSDEN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), p. 414).—None of several preplanting treatments, tried out chiefly on the Wedgewood and Imperator

varieties, caused well-developed buds to fail to open when forced later in the greenhouse. The different storage treatments did cause decided variations in the number of days to reach flowering and exerted certain other growth effects of lesser significance.

Problems in forcing Easter lilies, K. Post. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 415-418).—Phosphate applied to the soil in which bulbs were potted delayed flowering but did not reduce the stem length. The removal of scales or parts of scales reduced the number of flowers per bulb and the height of the plants. A temperature of 50° F. during the early period of growth delayed flowering but tended to increase the number of flowers per plant. The time required to reach flowering was reduced as the temperature was increased to 70°, but there were fewer buds per plant. Supplemental light hastened flowering when the temperature was below 65°, but reduced the number of buds. Supplemental light had no effect on the time of flowering at 65° or more.

Further studies on factors affecting the forcing performance of Easter lily bulbs, P. BRIERLEY and A. H. CURTIS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), p. 432).—Creole lily bulbs dug at six dates from June 16 to August 16 and stored at 50° F. came into bloom in the greenhouse from October 23 to January 28, according to date of digging. The combination of early harvest and 50° storage brought domestic bulbs into bloom in time to compete with imported bulbs stored from the preceding season. Bulb maturity at harvest was the limiting factor, as shown by the fact that some of the bulbs dug in June were not sufficiently mature to respond to storage treatment. Bulbs affected with mosaic disease were slower to emerge and to bloom and bore inferior flowers.

Effect of aeration on growth of hybrid tea roses, A. W. BOICOURT and R. C. ALLEN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 423-425).—Signora roses budded on *Rosa multiflora* stocks and grown in (1) clay soil without aeration, (2) clay soil with forced aeration, (3) clay-peat mixture without aeration, and (4) clay-peat mixture with aeration made 37.3, 68.4, 81.2, and 155.8 in. of average linear growth per plant, respectively, in the period June 18 to September 18, 1940. The mean O₂ contents of the media were 18.8, 20.3, 19.3, and 20.2 percent, and the mean CO₂ contents were 1.5, 0.3, 1.9, and 0.6 percent, respectively. Although the O₂ differences were small, it is conceded possible that the rose plants may have responded to the small increments. Furthermore, there may have been regions of lower O₂ content than shown by the tests. Other factors besides O₂ content may have contributed to the favorable results in the aerated soil-peat. Determinations of NO₃, P₂O₅, and K₂O showed no detectable differences attributable to soil treatment.

Some factors causing fading in color of rose blooms, J. C. RATSEK. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 419-422).—Observations on the flowers of Talisman rose plants pruned to various degrees showed a progressive decrease in color as the intensity of the pruning increased. In defoliation experiments, stems with leaves produced more pigment in their blooms than did defoliated stems. Sugar solutions, introduced through a leaf petiole, appeared to increase pigment formation in the nondefoliated but not in the defoliated stems. The color was lighter when there were more blooms per stem, apparently the result of competition for available carbohydrates. Covering buds with brown or glassine paper reduced the formation of pigments, suggesting that sunlight may be necessary for the full development of the red pigment. Defoliation experiments with other varieties confirmed the results with Talisman. It is suggested that the summer fading of roses may

be due to the effect of higher temperatures in increasing wood growth and thus decreasing the carbohydrates needed in pigment formation.

Ornamental trees and shrubs for New Mexico, J. V. ENZIE (*New Mexico Sta. Bul.* 284 (1941), pp. 48, figs. 31).—This bulletin contains general information as to the adaptability and characteristics of various ornamentals useful for planting in New Mexico. An article by F. F. Whitley is appended which divides the State into zones suitable for various species.

The winter hardiness of some ornamental woody plants of New York State, J. F. CORNMAN ([*New York*] *Cornell Sta. Bul.* 772 (1941), pp. 32, figs. 6).—Composed largely of specific information on the winter hardiness of various ornamental plants, arranged alphabetically by their botanical names, this bulletin presents information as to the nature and causes of winter injury, factors involved in the development of resistance or susceptibility, and methods of protecting plants from low-temperature injury. A hardiness map, dividing the State into six zones, is presented, together with information as to the typical plant response and climate in each of these zones.

Growth of pin oak following transplanting and pruning, A. M. S. PRIDHAM. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), p. 440).—Girth measurements on pin oaks of approximately 4-in. caliper when transplanted in the fall of 1937 revealed greatly reduced growth, extending at least into the third season, as compared with unmoved trees. Since neither root pruning nor top pruning in April 1940 had any significant effect on growth of pin oaks that season, the author suggests that other factors in transplanting, such as season, the soil preparation, and care in handling, may have been involved.

Response of red oak to fertilization with ammonium sulfate, A. M. S. PRIDHAM. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), p. 439).—Red oaks planted as street trees were fertilized from 1936 through 1940 with NH_4SO_4 at the rate of 10 oz. for each inch of trunk diameter. The fertilizer was broadcast or placed in holes 10–12 in. deep. For comparison, a complete fertilizer 6–8–4 was used at the same rate based on N content. The major response was in autumn color. As compared with 84 percent of the control trees taking on autumnal color October 15 to November 1, only 28 percent turned color where the NH_4SO_4 was placed in holes. With complete fertilizer none of the trees showed autumnal color by November 1.

FORESTRY

[**Forestry studies by the Alabama Station**] (*Alabama Sta. Rpt.* 1940, pp. 7–8, 30–32).—The following studies are briefly discussed: Present and potential production of farm woodland areas in Marion County, by B. T. Lanham, Jr.; the quantity and quality factors as affected by stand in second-growth pines, by L. M. Ware and J. E. Bryan, Jr.; and selectivity studies on slash pine and loblolly pine underplanted in an existing hardwood stand, by W. R. Boggess and Bryan.

Methods of forecasting timber growth in irregular stands, W. G. WAHLENBERG (*U. S. Dept. Agr., Tech. Bul.* 796 (1941), pp. 56, pl. 1, figs. 7).—There is included a discussion of numerous specific questions connected with the problem of predicting timber growth of irregular stands over relatively short periods of time. Some of the pitfalls in using growth percentage are pointed out, and the several variations of the stand-table-projection method are discussed. The principal steps of forecasting by this method are presented in detail. The more common fallacies involved in forecasting growth are outlined, and a method of converting a stand table using one diameter-class interval to the equivalent

table using another class interval is illustrated. Assumptions, hypotheses, and other possible sources of errors of unknown magnitudes, e. g., the failure to make correct allowance for mortality or for acceleration or deceleration of growth, are discussed. The recurring-inventory method of determining growth is reviewed because it promises to become the principal means of control in the more intensive management of irregular forests.

A preliminary study of growth in the beech, *Fagus grandifolia*, by the dendrographic method, R. C. FRIESNER (*Butler Univ. Bot. Studies*, 5 (1941), *Papers 1-8*, pp. 85-94, fig. 1).—Records taken on three trees with the aid of dendrometers and a dendrograph showed the first changes in growth at the time the leaves attained full size, about the middle of May in 1940. Radial increases rose steadily to maximal rates in the week ended June 17 and then declined steadily to the zero point about July 15. Radial losses resulting from excess transpiration occurred from July 15 to August 12. The dendrometer showed slightly longer radii at the time of leaf fall than on July 15. The influence of several factors, rainfall, temperature, and light, on diametral growth are discussed and are believed to constitute a complex governing growth. Daily curves showed maximum diameters about 6 a. m. and minimum from 4 to 6 p. m.

Forest replacement rates in the Colorado Headwaters area, R. L. IVES (*Bul. Torrey Bot. Club*, 68 (1941), No. 6, pp. 407-408).—Observations on an area located largely in Grand County, Colo., with an elevation of 8,000 to 11,000 ft. and burned over in 1862 and 1863, indicated the following replacement rates in terms of years since the original fire: Maximum brush growth 25, maximum aspen growth 40, aspen largely eliminated 65, and estimated complete elimination of burned effects 300 yr.

Longevity of black cherry in Pennsylvania, A. F. HOUGH. (U. S. D. A.). (*Forest Leaves*, 30 (1940), No. 2, p. 16, fig. 1).

Strength properties of Chinese elm grown in Michigan, A. J. PANSHIN (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 115-117).—Chinese elm wood (*Ulmus pumila*) has a specific gravity of about 0.5, based on oven-dry weight and volume. The sapwood is light yellow, while the heartwood ranges from brown to dark brown, with a reddish tinge. The wood when planed has a good figure caused by the alternate bands of the open-textured, lighter-colored springwood and the close-textured, darker summerwood.

Testing machine data indicate that the fast-grown wood of Chinese elm is inferior in modulus of elasticity to the wood of average strength of the three American species of elm. It is comparable to American elm (*U. americana*) in modulus of rupture and in shear parallel to the grain, but is inferior in this respect to slippery elm (*U. fulva*) and to rock elm (*U. thomasi*). In compression parallel to the grain, the samples of Chinese elm tested were superior to American elm, comparable to slippery elm, and inferior only to rock elm. In hardness, both on end and side grain, Chinese elm was excelled only by the rock elm. On the basis of strength, fast-grown Chinese elm may be considered equal to American and slippery elms except in static bending, in which it has a considerably lower modulus of elasticity.

The identification of coniferous woods by their microscopic structure, E. W. J. PHILLIPS (*Jour. Linn. Soc. London, Bot.*, 52 (1941), No. 343, pp. 259-320, pls. 3, figs. 5).

Fire Control Notes, [January 1942] (U. S. Dept. Agr., Forest Serv., *Fire Control Notes*, 6 (1942), No. 1, pp. II+44, figs. 13).—In the usual form (E. S. R., 86, p. 200), information is presented on fire prevention, fire-fighting plans and equipment, technics, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, [December 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), Nos. 22, pp. 539-555; 23, pp. 555-591, figs. 3).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 22, *Piper* to *Populus*, and 23, *Populus* continued to *Prosopis*), the following items are noted:

No. 22.—An abnormality of *Abies balsamea* due to *Sclerotinia kernerii* or a closely related fungus, by E. K. Cash; a systemic arsenic toxicity of peach and apricot on old apple land, by E. C. Blodgett; nut diseases (Persian walnut and filbert) in the Pacific Northwest in 1941, by P. W. Miller; some observations on cereal diseases in Virginia in 1941, by S. B. Fenne; cereal rusts in the Great Plains region (Texas, Oklahoma, and Kansas); and a brief note on *Cercospora* leaf spot on chrysanthemums in Alabama.

No. 23.—Collections of fungi, bacteria, and nematodes of grasses (an annotated list), by C. L. Lefebvre and H. W. Johnson; peanut diseases in certain Texas counties in 1941, with notes on occurrence of peanut rust, by G. KenKnight; and brief notes on an isolated case of black shank on tobacco in Kentucky and black canker (*Phylospora miyabeana*) of willow in West Virginia.

Plant science section (*Jour. Colo.-Wyo. Acad. Sci.*, 2 (1940), No. 6, pp. 35-38; 3 (1941), No. 1, pp. 33-39).—The following abstracts of papers are of interest to plant pathology:

Vol. 2, No. 6.—Pathogenicity and Sexual Phenomena Exhibited by *Phytophthora capsici*, by W. A. Kreutzer, L. W. Durrell, and E. W. Bodine (p. 35). The Pigment of *Phoma terrestris*, by W. A. Kreutzer (p. 36), and The Effects of Growth Inhibiting Substances on Fusaria From Carnations, by J. L. Forsberg (p. 36) (all Colo. State Col.); and Some Practical Measures in the Control of Ring Rot of Potatoes, by G. H. Starr (p. 36) (Univ. Wyo.).

Vol. 3, No. 1.—The Relation Between the Pathogenicities of Three Root-Rotting Organisms of Wheat, by W. D. Thomas, Jr. (p. 36) (Colo. State Col.); *Verticillium* Wilt of Sugar Beet, by J. O. Gaskill and W. A. Kreutzer (pp. 36-37) (U. S. D. A. and Colo. State Col.); and The Effect of Soil Temperature on *Fusarium* Wilt of Carnations, by J. L. Forsberg (p. 37) (Colo. State Col.).

[Plant disease work by the Alabama Station] (*Alabama Sta. Rpt. 1940*, pp. 18, 20-21).—Brief reports are included on cotton rust due to K deficiency; and on *Sclerotium rolfsii*, *S. trifoliorum*, *Colletotrichum trifolii*, *Stagonospora meliloti*, and *Botrytis* sp. as factors in the elimination of white clover from Alabama pastures during summer.

[Plant disease studies by the Colorado Station] (*Colorado Sta. Rpt. 1941*, pp. 11-12, 18-19, 30-31, 31-32, 37).—Brief reports of progress are included on bacterial winterkilling in alfalfa, with particular reference to inheritance of resistance and hardiness; ring rot of potato, diagnosis, the soft rots following it, and control; chlorosis of stone fruits and its control; resistance of carnations to root rot; peach mosaic; a new *Macrosporium* rot of potato; and histology of winter injury in raspberry canes.

Enfermedades de las plantas cultivadas en la Provincia de Santa Fe, II [Diseases of cultivated plants in the Province of Sante Fe, Argentina, II], E. SCHIEL (*Inst. Expt. Invest. y Fomento Agr. Ganad. [Santa Fe, Argentina]*, *Pub. Tec. 21* (1940), pp. 23).—A continuation of the annotated list previously noted (E. S. R., 84, p. 200).

Enfermedades y plagas principales de la agricultura Uruguaya [The principal diseases and pests of Uruguayan agriculture] (*Uruguay Min. Ganad.*

y Agr., [Pam.] 55 (1941), pp. [1]+19).—This is an annotated list of the most important diseases due to fungi, bacteria, and viruses, and the principal insect pests of economic crops, giving hosts, distribution, etc.

Ītogī nauchno-issledovatel'skikh rabot vsesoiūznogo instituta zashchity rastenii za 1939 g. (Summary of the scientific research work of the Institute of Plant Protection for the year 1939) (*Moskva: Vsesoiūzn. Akad. Sel'sk. Khoz. Nauk Lenina, Inst. Zashch. Rast., 1940, pp. 184, figs. 19*).—The following are of interest to phytopathology: *Kratkie itogi rabot po fitopatologicheskomu obosnovaniū selektsii i ofsenki sortov na ustoichivost' k zabolevaniām v razreze gruppovoga immuniteta* (Brief Results of the Work Upon the Phytopathologic Basis of Selection and Estimation of Sorts Upon Resistance to Diseases in the Interpretation of Group Immunity), by T. Ī. Fedotova (pp. 52-58); *Ītogī rabot po rzhavchīne khlebnykh zlakov* (Results of the Work Upon Cereal Rust), by K. (C.) M. Stepanov (pp. 58-67); *Prīchiny vspyshek sil'nogo pazvitiā sklerotini i snezhnoi pleseni na ozimnykh posevakh i uviādaniā sel'skokhoziāistvennykh kul'tur* (The Causes of Outbreaks of Severe Development of *Sclerotinia* and *Fusarium nivale* on Winter Sowings and Withering of Agricultural Crops), by S. M. Tupenevich (Toopenevitch) (pp. 67-71); *Ītogī rabot po obosnovaniū termicheskogo i khimicheskogo metodov bor'by s pyl'noi i mokrōi glavnoi pshenišy* (Results of the Works for the Basing of Thermic and Chemical Control Measures Against Wheat Bunt (*Tilletia tritici*) and Loose Smut (*Ustilago tritici*) of Wheat), by S. T. Bubentsov (Boobentzov) (pp. 71-74); *Razrabotka mer bor'by s virusnymi bolezniām kartofeli i tomatov* (On the Control Measures Against Potato and Tomato Virus Diseases), by M. S. Dunin (Doonin) (pp. 74-80); *Vozbuditeli bakteriozov pshenišy, ūchmenā, i kartofeli i metody ikh obnaruzheniā* (The Causal Organisms of Wheat, Barley, and Potato Bacteriases and Methods for Their Detection), by D. Ī. Belenkii (Belenki) (pp. 81-85); *Kratkie itogi raboty laboratorii fitosistematiki VĪZR* (Brief Results of the Work of the Phytosystematic Laboratory of the Institute for Plant Protection), by N. A. Naumov (Naomov) (pp. 85-87); *Ītogī issledovaniū po obosnovaniū i ispytaniū opytnykh variantov sistemy meropriiatiū v sadakh Krasnodarskogo kraia* (Results of Investigations by the Basing and Testing of Experimental Modifications of the Control Method System in the Gardens of the Krasnodar Region), by V. Ī. Parfent'ev (V. J. Parfentiev) (pp. 112-120); *Rezultaty prīmeneniā grībnykh, bakterial'nykh i virusnykh vozbuditelei boleznei hasekomykh v bor'be s vrediteliām sel'skogo khoziāistva* (Results of the Utilization of Fungus, Bacterial and Virus Diseases as a Control Measure Against Agricultural Pests), by V. P. Pospelov (pp. 125-129); *Rezultaty rabot po bio i fiziko-khimicheskomu obosnovaniū zffektivnosti i konstruirovaniū fungitsidov dlia bor'by s rzhavchīnoi, pyl'noi i tverdoi glavnoi pshenišy* (Results Upon the Bio- and Physiochemical Basing of the Effectivity and Constructivity of Fungicides for the Control of Rust, Wheat Bunt, and Loose Smut of Wheat), by Ī. M. Poliakov (pp. 145-150); *Īzuchenie vliāniā prīmesei, vstrechafūshchikhsia v preparate "AB," na ego toksichnost'* (The Study of the Influence of Admixtures, Encountered in the Preparation "AB," on Its Toxic Action), by M. S. and Ī. K. Kholodnik (I. C. Holodniok) (pp. 150-152); and *Ītogī nauchno-issledovatel'skikh rabot VĪZR po mekhanizatsii zashchity rastenii* (The Results of Scientific Research Work of the Institute for Plant Protection Concerning the Mechanization of Plant Protection), by Ī. P. Īt'senko (Jatzenko) (pp. 153-181).

Soil treatments for the control of diseases in the greenhouse and the seedbed, A. G. NEWHALL, C. CHUPP, and C. E. F. GUTERMAN (*N. Y. State Col. Agr., Cornell Ext. Bul. 217, rev. (1940), pp. 58, figs. 31*).

New and improved methods for study of fungicides, J. M. HAMILTON and G. L. MACK (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 10, 13).—A brief summary of recently developed laboratory and greenhouse procedures for evaluating the efficiency of spray materials before they are recommended to the public.

Spray injury studies: Progress report II.—The effects of time and temperature on the production of hydrogen sulphide during atmospheric decomposition of lime sulphur, W. E. BERRY (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1939, pp. 52-56, fig. 1*).—A continuation of previous work (E. S. R., 82, p. 784).

Radioactive copper and the mechanism of oligodynamic action, D. MAZIA and L. J. MULINS. (Univ. Calif., Univ. Mo., et al.). (*Nature [London]*, 147 (1941), No. 3734, p. 642).—Using leaves of *Elodea canadensis*, it is concluded that Cu in extreme dilutions exerts its physiological effects by virtue of the power of protoplasm to bind ions against a concentration gradient, so that the concentrations actually present are relatively high. These concentrations later decrease in the cell, and the physiological effect of the heavy metal ion disappears concomitant with this decrease in concentration.

The effect of certain chemicals, some of which produce chromosome doubling, on plant tumors, N. A. BROWN (*Phytopathology*, 32 (1942), No. 1, pp. 25-45, figs. 2).—The chromosome-doubling agents acenaphthene, α -methyl-naphthalene, α -nitronaphthalene, 3,5-dibromopyridine, and apiole failed to act on *Bacterium (=Phytomonas) tumefaciens* tumors in the same way as colchicine (E. S. R., 81, p. 53). The tumor cells seemed to have their own specific response to a chemical according to plant species and, with a few exceptions, according to age of tumor. No excessive chromosome doubling in nuclei of young tumors thus treated took place as it did with colchicine treatment. There was no stimulation of tumor growth by acenaphthene, except where tumors were brushed with it in chlorinated-naphthalene solution and temporarily in seedling marigolds watered with a saturated aqueous solution. Acenaphthene dissolved in dioxan did not produce the noticeable stimulation of tumor development so characteristic of colchicine before inhibition and death. Three percent acenaphthene in dioxan failed to kill marigold tumors (young or old) or young Paris daisy tumors, but killed the latter when 36 or more days old. Any growth inhibition in marigold tumors by acenaphthene dissolved in dioxan was usually overcome. Dwarfing occurred when apiole was brushed on tumors, but no darkening or death. Full-strength or 50 percent emulsion of α -methyl-naphthalene brushed on young marigold and Paris daisy tumors inhibited further growth and killed old but growing tumors on both hosts. With α -methyl-naphthalene brushed on stem tumors of the related *Bryophyllum pinnatum* and *Kalanchoe daigremontiana*, in a month there was no effect on the first, whereas *Kalanchoe* tumors were dead in 2 weeks. α -Nitronaphthalene and 3,5-dibromopyridine in saturated aqueous solutions and in lanolin paste brushed on young and old Paris daisy and marigold tumors gave negative results. Heptyl aldehyde and methyl salicylate, not known to be polyploidizing agents but used by animal pathologists in the control of mouse tumors, were also applied to bacterial plant tumors. Brushing normal heptyl aldehyde full strength on 12 14-day-old marigold tumors killed them in 24 hr., whereas 18-day-old daisy tumors became slightly shrunken. In 3 weeks only half of the 18-day-old tumors were dead. A 20 percent emulsion of *n*-heptyl aldehyde killed 20 25-day-old marigold tumors in 3 days, but 8-day-old marigold tumors were not affected. A 10 percent emulsion of this chemical killed 10 46-day-old daisy tumors. Full strength α -methyl salicylate killed 30- to 44-day-old but not 12- to 15-day-old marigold tumors. Paris daisy tumors 16-26 days

old were killed with α -methyl salicylate, and tumors 7 days old when brushed were inhibited.

Molds found in Indianapolis markets, P. LENTZ (*Butler Univ. Bot. Studies*, 5 (1941), *Papers 1-8*, pp. 58-66).—From September 15 to December 15, 1939, 21 mold genera were isolated from fruits and vegetables in Indianapolis markets. *Penicillium*, *Rhizopus*, *Aspergillus*, and *Alternaria* predominated, followed by *Oospora*, *Fusarium*, *Monilia*, *Monosporium*, and *Isaria*. Plants which were host to 4 or more genera were banana, cabbage, carrot, eggplant, onion, potato, and tomato. *Alternaria* and *Fusarium* grew predominantly on hosts growing in or near the soil, *Aspergillus* and *Monilia* were more common on ordinary orchard fruits, whereas *Penicillium* was the only genus found on citrus fruits.

Descriptions of tropical rusts, IV, G. B. CUMMINS. (Ind. Expt. Sta.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 7, pp. 467-472, figs. 4).—This installment (E. S. R., 84, p. 773) contributes seven new species and two new combinations in rust taxonomy.

Om Nomenklatur for Plantevira samt nogle Synonymer for Kartoffelvira og Kartoffelvirosor [The nomenclature of plant viruses, together with a list of synonyms of potato viruses and viroses], H. P. HANSEN (*Tidsskr. Planteavl.* 46 (1941), No. 2, pp. 363-372; *Eng. abs.*, pp. 369-372).—The various nomenclatorial systems are discussed, and the synonyms for the European potato viruses are listed.

Crown gall production by bacteria-free tumor tissues, P. R. WHITE and A. C. BRAUN (*Science*, 94 (1941), No. 2436, pp. 239-241).—The results of studies summarized in this preliminary report, in which the technics for in vitro culture of excised plant tissues were used, appear to furnish almost unquestionable evidence that crown gall tissues may multiply rapidly without continued stimulation from *Phytomonas tumefaciens* once their capacity for autonomous growth has become established. The data apparently indicate that the tumor-inducing capacity was retained by bacteria-free tissues through at least 10 successive passages in vitro. It seems clear that the affected tissues underwent a drastic change, indicated by their capacity to produce galls, a quality not found in normal tissue, and by their behavior in vitro, where their growth habits differed markedly from those of normal tissues under identical conditions. It is believed that this change is brought about originally by some stimulus from the crown gall organism, but that its maintenance does not depend on the continued presence of these bacteria.

The relation between *Polyporus abietinus* (Dicks. ex Fr.) Fr. and *Irpex fuscoviolaceus* (Ehrenb. ex Fr.) Fr., R. RAESTAD (*Nytt Mag. Naturv.*, 81 (1941), pp. 207-231, figs. 5).—This study of the taxonomic history, occurrence, morphology, appearance in culture, wood decay induced, and sexuality of these fungi is believed to demonstrate that the two European forms, connected by the American intermediate types, are members of a complex of nearly related forms which must be considered as one species, for which *P. abietinus* is the preferred name. The diagnosis of this species must include all the American forms, whereas the subspecies are restricted to the comparatively homogenous forms occurring in Europe.

Technique for artificially feeding *Scolytus multistriatus* and *Saperda tridentata* spores of *Ceratostomella ulmi* and other substances, W. D. BUCHANAN and C. MAY. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 1, pp. 95-97, fig. 1).—Adults of *Scolytus multistriatus* attached by their feet with cellulose glue to the ends of match sticks freely fed upon aqueous suspensions of *C. ulmi*, Neoprontosil, ground elm bark, and arsenic. The Neoprontosil solutions were fed directly into the mouths of the beetles, using a micromanipulator

and micropipette. The other solutions were ingested from the ends of small tubes. Ground bark similar to that ingested was found in the digestive tracts of several dissected beetles. This method renders it possible to remove and culture pellets of feces to determine the viability of *C. ulmi* after passage through the digestive tract. The same technic was successfully used with *S. sulcatus* and *Saperda tridentata*.

Factors influencing variety yield differences in 1941, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 2, pp. 6-10).—Leaf rust of wheat, crown rust of oats, and flax rust were abundant in 1941 and varieties lacking resistance to these diseases were at a distinct disadvantage. This was especially true in eastern North Dakota and in other areas where these rusts were unusually severe. Some stem rust was present, but no serious injury on either wheat or oats was evident. Comparisons with other years are briefly noted, and the results of yield trials with the commonly grown varieties of wheat, oats, and flax are discussed and tabulated.

Susceptibility of Lee × Victoria oat selections to loose smut, G. M. REED and T. R. STANTON. (U. S. D. A. et al.). (*Phytopathology*, 32 (1942), No. 1, pp. 100-102).—A specimen of *Ustilago avenae* collected in Oklahoma (1934) was sent to the Brooklyn Botanic Garden where it was found to produce smut on Victoria oats and on certain hybrid strains derived from it. The Victoria and Lee varieties were infected 43.8 and 92.6 percent, respectively, whereas 22 selections from the Lee × Victoria cross exhibited an infection range of 6.6-68 percent. This race of the loose smut fungus is of special interest because of its pathogenicity for Victoria oats, a variety hitherto resistant to all known races of both oats smuts. It is designated race A-30.

En enkel snabbmetod för prövning av betningsmedlens verkan mot havreflygsot, Ustilago avenae (Pers.) Jensen [A simple rapid method of testing fungicides against oats loose smut, U. avenae], A. ZADE (*Nord. Jordbruksforsk.*, 1940, No. 7-8, pp. 244-255; *Ger. abs.*, pp. 252-255).

Scab of wheat and barley, J. J. CHRISTENSEN and R. C. ROSE (*Minn. Univ. Agr. Ext. Folder 97* (1941), pp. [6], figs. 12).

An epiphytotic of wheat septoriosiis [in Argentina], J. B. MARCHIONATTO (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), No. 6, pp. 113M-114M).—*Septoria tritici* and *S. nodorum* were concerned, the latter causing the most damage.

Soil conditions and the take-all disease of wheat.—VI, The effect of plant nutrition upon disease resistance, S. D. GARRETT (*Ann. Appl. Biol.*, 28 (1941), No. 1, pp. 14-18).—In further studies (E. S. R., 85, p. 208), Red Marvel spring wheat was grown in sand culture with full nutrients and with deficiencies in N, P, and K and in all three together. After a month's growth the plants were inoculated with *Ophiobolus graminis*. Satisfactory root infection occurred in all cases but was lightest in the N-deficient plants, whereas the K-deficient plants had a rather more intense root infection than any of the other series. Percentage infection of the stem bases was lowest in the full nutrient and N-deficient plants, and highest under deficiency of all three nutrients. In the uninoculated controls, a significant depression in grain yield was produced only by P deficiency, but in the inoculated plants deficiency in any one of the three nutrients significantly reduced the grain yields. Infection significantly reduced yields in every series except that receiving full nutrients. The percentage reduction was greatest in the P-deficient plants.

Effect of certain environmental conditions on the prevalence of Ophiobolus graminis in the soil, H. FELLOWS. (U. S. D. A. coop. Kans. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 12, pp. 715-726, figs. 3).—In pure culture

the fungus causing take-all of wheat was not killed by Kansas winter temperatures, nor was it affected by repeated abrupt alternations of growing and subfreezing temperatures. The thermal death point of both microhyphae and macrohyphae was about 50° C., and in spontaneously infested soil the fungus withstood 71°. Summer drought or high temperatures reduced soil infestation only slightly, nor was the abundance of the fungus in soils reduced by repeated alternations from growing to subfreezing temperatures. The abundance of the parasite in infested soil as measured by disease in subsequently grown wheat was reduced in varying degrees by different combinations of moisture, temperature, and compactness of the soil during a storage period. However, it remained viable as long as 777 days in moist or dry soil stored in a warm greenhouse. In general, soil stored in a cool cave tended to retain the fungus longer than warm soil, and it was reduced most in a warm, loose, moist soil and least in a cool, compact, moist soil.

Wind dissemination of angular leaf spot of cotton, J. G. BROWN. (Univ. Ariz.). (*Phytopathology*, 32 (1942), No. 1, pp. 81-90, figs. 3).—Commercial cottonfields in Arizona so located and planted as to fulfill experimental requirements were studied in relation to wind dissemination of *Phytophthora malvacearum*, the cause of angular leaf spot (black arm). In an area with easterly summer winds prevailing, virgin soil was planted with H₂SO₄-delinted and Ceresadusted seed, and similar tracts were sown with untreated seed from the same lot—one field on the east and one on the west of the area. Control fields some miles distant were planted with seed from a common lot and with identical treatment. All were irrigated from individual wells, thus insuring against spread of inoculum from one field to another in the irrigation water. Cotton growing in the area of mixed planting (fields from treated and untreated seed) were wounded on their eastern sides by an August hailstorm. One week later they were subjected to a violent duststorm moving towards the west. Subsequently, black arm practically ruined the crop in the affected area. Evidence is presented to prove that inoculum carried by wind-blown dust originating in the fields grown from untreated seed caused the infection and resulting losses. No black arm appeared in the second area in fields used as controls.

Accidium gossypii, the aecial stage of Puccinia boutelouae, J. T. PRESLEY. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 32 (1942), No. 1, pp. 97-99).—Greenhouse inoculations established the connection of *A. gossypii* on cotton with a *Puccinia* sp. on *Bouteloua* spp. tentatively identified as *P. boutelouae*.

Antecedentes sobre la "roya" del algodouero en la Republica Argentina [Comments on cotton rust in Argentina], M. A. DI FONZO (*Argentina Min. Agr., Junta Nac. Algodón, Bol. Mens. No. 73* (1941), pp. 419-420, fig. 1).—This review considers some aspects of this generally little known rust of cotton (*Cerotelium desmium*) in Argentina, referring to the history and nomenclature of the fungus and to the symptoms, transmission, and importance of the disease.

La stenosis: Un achicamiento y arrugamiento del algodón [Stenosis: A stunting and crinkling of the cotton plant], R. OBREGÓN BOTERO (*Bogotá, Colombia: Min. Econ. Nac., 1940, pp. 16, figs. 6*).—The symptoms of this disease, involving reductions in size of plant and rolling of leaves, are described in detail and compared with other deformation troubles (brachymia, tomosis, hybosis, acromania, cyrtosis, and mosaic). Theories as to the cause are discussed, the author inclining toward a virus etiology. The questions of resistance and other means of control are considered, with recommendations.

Flax wilt (*Fusarium lini*) in New England, G. T. S. BAYLIS (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 3A, pp. 157A-162A, figs. 2).—A general discussion of flax wilt, only recently recognized in New Zealand, and its control.

Studies on *Uromyces lespedezae-procumbentis* in Japan, N. HIRATSUKA (*Tottori Nôgaku-Kwaihô (Trans. Tottori Soc. Agr. Sci.)*, 7 (1940), No. 1-4, pp. 63-79; *Jap. abs.*, p. 79).—The author reports 21 species of *Lespedeza* as hosts of this rust in Japan. As a result of inoculation tests on different hosts, he establishes 3 specialized form species of the collective species, viz, *U. macrolespedezae*, *U. lespedezae-cuneatae*, and *U. lespedezae-pilosae*. The collective species *U. lespedezae-procumbentis* is very widely distributed in Japanese territories, extending from Hokkaido on the north to the Rinkiu Islands and Taiwan (Formosa) on the south.

Eye-spot of Napier grass in Hawaii, caused by *Helminthosporium sacchari*, G. K. PARRIS. (Hawaii Expt. Sta.). (*Phytopathology*, 32 (1942), No. 1, pp. 46-63, figs. 6).—This disease of *Pennisetum purpureum* in Hawaii, first appearing in October 1939, has caused severe losses, entire plantings being rendered useless for fodder and many fields replanted with other grasses. The causal agent is *H. sacchari*, for which *H. ocellum* is believed to be a synonym. Comparing the physiology of eight isolates of the fungus from Napier and one isolate from sugarcane, the former has an optimum of 21°-28° C., whereas that for the cane fungus has been variously reported as 20°-29°, 23.5°, and 30°. On certain substrates, at uniform temperature, there was little or no difference in appearance of the isolates from Napier and from cane; on others the cane fungus resembled certain Napier isolates but was distinct from other Napier isolates. Within the isolates from Napier, great variation in type of growth occurred on certain media. The fungus isolated from Napier produced larger spores at 28° than at 21°, but when isolated from cane the spores were larger at 21° than at 28°. These differences are not believed to be due to different species of *Helminthosporium* but to different strains of the single species *H. sacchari*. The Napier fungus was isolated, inoculated into healthy plants, the disease reproduced, and the fungus recovered in pure culture. Inoculated into sugarcane, Napier isolates have little effect, and the same is true of *H. sacchari* isolated from cane and inoculated into Napier. Merker grass, a variety of Napier, and certain reciprocal Napier×Merker crosses proved highly resistant. The local disease is controlled by substitution of this resistant material.

Potato diseases and their control, T. P. DYKSTRA (*U. S. Dept. Agr., Farmers' Bul. 1881* (1941), pp. II+65, figs. 50).—This describes the characteristics of the diseases and discusses the methods of control.

Potato disease control by breeding resistant varieties, F. J. STEVENSON. (U. S. D. A.). (*Iowa State Hort. Soc. [Rpt.]*, 74 (1939), pp. 221-235, fig. 1).—A summary of the national potato breeding program and discussion of potato breeding methods and equipment and of resistance to late blight and common scab.

Spraying and dusting potatoes, R. BONDE and W. C. LIBBY (*Maine Agr. Col. Ext. Bul. 290* (1940), pp. 14, figs. 7).

Three years of potato spraying in southeastern Wisconsin, O. C. WHIPPLE and T. C. ALLEN. (Wis. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 9, pp. 254-261).—In these 3-yr. tests on Irish Cobbler potatoes, varying the seasonal distribution of CuSO₄ and lime in bordeaux mixture had no advantage over the standard 5-5-50 formula. For commercial growers of this variety in southeastern Wisconsin this formula proved equal to or better than any of the other bordeaux formulas or fixed coppers tested in increasing yields. Certain proprietary compounds tested may, however, be used wisely by small growers or

home gardeners, since they are more convenient to make up and apply. Spraying may be expected to increase yields in relatively dry years when leaf diseases are not a factor, but in cool, wet years this response is less evident unless leaf blights appear early and become destructive.

Salaman's culture of blight resistant "Aya papa," J. G. HAWKES and H. W. HOWARD (*Nature [London]*, 148 (1941), No. 3740, p. 25).—This note is of interest in connection with a paper by Reddick (E. S. R., 83, p. 70) on the distribution of blight-resistant potatoes on the American Continent, and refers to the origin of the resistant potato from Ecuador known as Aya papa.

Infection of first-year potato seedlings with *Fusarium solani* var. *cumartii*, J. H. JENSEN and R. W. GOSS. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 19 (1941), No. 8, pp. 239-242).—Testing first-year seedlings for *Fusarium* wilt resistance in the greenhouse proved a rapid and satisfactory method of eliminating susceptibles, overcoming the disadvantage of cost in growing plants from tubers in the greenhouse and reducing the large number of escapes that often occur in the field. Although seedlings of desirable horticultural quality may be lost, the high percentage of infection obtained in all crosses thus far tested would indicate that the chances of securing resistant seedlings after selection has been made for other characters would be slight.

The effects of mosaic diseases on potatoes, R. J. SCOTT (*Scot. Jour. Agr.*, 23 (1941), No. 3, pp. 258-264).—Statistics are presented on the effects of four grades of mosaic, viz, negligible mottle, mild mosaic, borderline severe mosaic, and severe mosaic; leaf roll; and the wilding group, the severer forms reducing the yields by as much as 95 percent. The presence of virus induced earlier ripening. Severe mosaic increased on the average by twofold to threefold and leaf roll by fourfold from year to year. Control measures are outlined.

Studies on soil actinomycetes in relation to potato scab and its control, G. KENKNIGHT (*Michigan Sta. Tech. Bul.* 178 (1941), pp. 48).—Under the test conditions, none of numerous inorganic and organic chemicals and their combinations as soil treatments gave promise of practical control of potato scab in infested Michigan fields, and Hg compounds generally caused marked increases in scabbing. Evidence is presented that the primary reason for conflicting reports in the literature is that parasitic actinomycetes vary widely in their tolerance to Hg compounds. As one example of this situation, calomel controlled scab in both Long Island and Michigan soils artificially infested with actinomycetes from Long Island, whereas the same treatment caused an increase in scabbing in both soils artificially infested with strains from Michigan. In the latter case, there was an initial reduction in numbers of actinomycetes, but those that could tolerate the mercurials multiplied apparently as a result of reduction in competition from other micro-organisms. Mercury vapor appeared to react with substances in nutrient agar to produce substances toxic to micro-organisms, but when dry or in pure water the spores of the actinomycete most sensitive to Hg compounds were not injured by Hg vapor. Mixture of powdered Zn with Hg compounds appeared to accelerate the vaporization of Hg from its compounds. On the other hand, potassium permanganate, though apparently not affecting the toxicity of Hg compounds in solution, prevented the migration of Hg as vapor. Vapor from yellow oxide of Hg moved readily through 6 in. of sandy soils but not through loam, clay, or muck. However, when 0.1 gm. was mixed with 25 gm. of loam and covered with 6 in. of loam the vapor came through. Mixture of acids with mercurials prevented the evolution of Hg vapor. Field applications of HCl (1,500 lb. per acre) with calomel had no lasting effect on the soil reaction and no effect on the tendency of the mercurial to increase scabbing, whereas S, applied with calomel and given time to oxidize,

reduced the effect of the mercurial on scabbing. Soil treatment with calomel increased the scabbing on roots of beets and eggplants but not of radishes, turnips, or rutabagas. Lime plus calomel was more effective than calomel alone in aggravating scab of various *Actinomyces* hosts. In 3-yr. trials, 21 bacterial isolates, 41 actinomycetes, 7 fungi, and 2 yeasts added to scab-infested soils on various media failed to control scab. Green manures of bluegrass and alfalfa caused significant increases, and other forms of organic matter also tended to aggravate scabbing. Evidence was found that *Solanum melongena*, *S. nigrum*, *Amaranthus retroflexus*, and possibly also several other plants are hosts to phytopathogenic actinomycetes.

Report on potato virus diseases in 1940, T. P. DYKSTRA. (U. S. D. A.). (*Amer. Potato Jour.*, 19 (1941), No. 8, pp. 221-230).—This is a review (21 references) of some of the papers on potato virus diseases published in 1940.

Studier over Kartoffelvirosier i Danmark.—II, Fortsatte Sortsundersøgelser [Studies of the potato viruses of Denmark.—II, Varietal tests], H. P. HANSEN (*Tidsskr. Planteavl*, 46 (1941), No. 2, pp. 355-362; *Eng. abs.*, p. 362).—Continuing this study,² apparently healthy plants of 15 potato varieties, 11 of which are immune to wart disease, were examined for spontaneous virus infection.

Virusnye bolezni i iavleniia vyrozhdeniia kartofeli v Uzbekistane (Virus diseases and degeneration in potato of Uzbek), N. N. BALASHEV (*Dok. Vsesoiuzn. Akad. Selsk. Khoz. Nauk Lenina (Proc. Lenin Acad. Agr. Sci. U. S. S. R.)*, 8 (1941), pp. 22-27, figs. 3).

Specific transmission of varieties of potato yellow-dwarf virus by related insects, L. M. BLACK (*Amer. Potato Jour.*, 19 (1941), No. 8, pp. 231-233).—The New York and New Jersey varieties of the yellow dwarf virus, shown by cross-protection tests to be varieties of the same virus species (*Marmor vastans*), were found to be transmitted specifically by the respective aphids *Aceratagallia sanguinolenta* and *Agallia constricta*. The New Jersey virus form is named *M. vastans agalliae* n. var. The specific relationship between these two virus varieties and their related insect vectors is compared with such highly specialized parasites as the rusts, and the evolutionary possibilities are discussed.

Wilting of the terminal bud in potato [in Argentina], J. B. MARCHIONATTO (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), No. 9, pp. 161M-162M).—During the 1937-38 and 1938-39 seasons severe damage was reported from the appearance of this disease of then unknown cause. Transmission studies indicated it to be due to a virus found transferable to potato, tomato, tobacco, and pepper, but with difficulty to dahlia. Some of its main properties are given.

Factors affecting the germination of sugar-beet and other seeds, with special reference to the toxic effects of ammonia, M. STOUT and B. TOLMAN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 12, pp. 687-713, figs. 6).—Studying the properties of dry- and fleshy-fruit extracts in relation to their action on germinating seeds, sufficient ammonia was found to be released by enzymatic hydrolysis from sugar beet seed-ball extracts and certain other dry-fruit extracts and also from dilute solutions of urea and asparagin to account for their toxic effects. The radicles of germinating seeds, young seedlings, and 2-month-old sugar beet plants were killed in solutions containing 0.3-0.4 mg. of free NH_3 per cubic centimeter and concentrations as low as 0.1 mg. per cubic centimeter were toxic when maintained. NH_4 salts such as

² *Tidsskr. Planteavl*, 42 (1937), No. 4, pp. 631-681, figs. 7; *Eng. abs.*, pp. 678-681.

(NH)₂SO₄ proved comparatively nontoxic. The increase in the pH value of extracts or solutions did not fully explain the toxic effects observed. There was a marked differential tolerance of the seeds tested to osmotic pressure, which seemed to account largely for inhibiting the germination of seeds in contact with juices of fleshy fruits. The removal of water-soluble N compounds from pericarpal tissues affords an explanation of the beneficial effects of washing or soaking some seeds prior to germination tests.

Transmission of chlorotic streak of sugar cane by the leaf hopper *Draeculacephala portola*, E. V. ABBOTT and J. W. INGRAM. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 1, pp. 99-100).—In an insect-proof greenhouse, five leafhoppers per plant were introduced into insect-proof cages containing infected sugarcane (C. P. 29/320) plants and an equal number of healthy plants grown in steam-sterilized soil in sterilized clay pots from cuttings treated with hot water at 52° C. for 20 min. (a treatment known to eliminate the virus). In other cases the insects were allowed to feed 2-4 weeks on infected plants and then caged with healthy plants alone. Of a total of 490 healthy plants thus exposed to *D. portola*, 25 subsequently developed typical chlorotic streak symptoms. Of these, 20 were from cages containing both diseased and healthy plants, and 5 from cages containing only healthy plants but fed on by insects which previously had fed on diseased plants. Healthy plants caged with infected ones, but without the insects, and other healthy plants growing in the greenhouse along with diseased ones all remained healthy.

Sweet potato pox (*New Jersey Stas. Plant Disease Notes*, 19 (1941), No. 3, pp. 9-12).—The disease due to *Actinomyces ipomoea* and its control by application of S to soil are described for the grower.

Isolation of crystalline tobacco mosaic virus protein using water miscible solvents, C. G. VINSON. (Univ. Mo.). (*Science*, 94 (1941), No. 2450, p. 551).—An abstract.

Influence of nitrogen supply on the rate of multiplication of tobacco-mosaic virus, E. L. SPENCER (*Plant Physiol.*, 16 (1941), No. 4, pp. 663-675, figs. 3).—Turkish tobacco plants grown in sand were supplied with nutrient solutions containing low, medium, or high N supplies, respectively. Assay for virus activity was made on Early Golden Cluster bean, and the virus protein was isolated by air-driven ultracentrifuge. In young plants a difference in virus activity could be detected as early as the fifth day after inoculation, when the juice expressed from low-N plants was only about 35 percent as active as when more N was received, and by the eighth day it was less than 25 percent as active. A threefold difference was recorded in the virus-protein content of the juices under these two treatments. The activity data calculated per plant indicated that by the eighth day after inoculation the juice from the high-N plants contained 12 times more virus than that from the low-N plants. From the fourth to the twelfth day after inoculation the virus-protein content of the juice expressed from the low-N plants increased about 20 times, whereas that of juice from the high-N plants increased over 200 times. Older diseased plants receiving the medium-N solution for longer periods before being given the high-N solution attained greater virus activity as a result of the supplementary N. The data indicate that the larger the plant the more time is required for the increased N supply to become effective. The evidence is interpreted as supporting the view that the increased virus activity associated with an increased N supply is due primarily to an increase in the rate of virus multiplication in the high-N plants and only slightly, if at all, to the partial inactivation of the virus entity in the low-N plants.

Some properties of tobacco etch viruses, F. C. BAWDEN and B. KASSANIS (*Ann. Appl. Biol.* 28 (1941), No. 2, pp. 107-118, pl. 1).—The symptoms of severe

and mild etch are described. Both types contain intranuclear and cytoplasmic inclusions. Fewer and larger crystals are formed in the nuclei of plants with mild etch. Seedling plants infected with severe etch developed malformed leaves in which cytoplasmic inclusions crystallized to give rise to birefringent needles. Mild etch protected plants from severe etch, and the two viruses proved to be serologically related. Although not serologically related to potato virus Y or *Hyoscyamus* virus 3, severe etch virus has similar properties in vitro and is transmitted in the same way. The interactions of these three viruses in the plant suggest that they may be related. Plants infected with either of the other viruses are not protected against severe etch, and those infected with potato virus Y are susceptible to *Hyoscyamus* virus 3. Plants with severe etch, however, are protected against the other viruses, and those with *Hyoscyamus* virus 3 are protected against potato virus Y. Severe etch suppresses these two viruses when healthy plants are infected with a mixed inoculum, and supplants them in tissues in which they are already established. Similarly, *Hyoscyamus* virus 3 can suppress and supplant potato virus Y. Possible interpretations are given for these results. Severe etch virus has asymmetrical particles, since concentrated preparations exhibited anisotropy of flow.

Treatment of tobacco plant bed soil with nitrogenous fertilizers, R. G. HENDERSON. (Va. Expt. Sta.). (*Agr. News Letter*, 9 (1941), No. 5, pp. 72-78).—Greenhouse experiments with soil infested heavily with black root rot (*Thielaviopsis basicola*) showed that root rot failed to develop on tobacco seedlings grown in this soil after $\frac{1}{2}$ lb. or more of urea had been applied per square yard and in which the reaction rose from pH 6.9 to more than pH 8.6 for some time from ammonia accumulation due to urea break-down. Weed growth was also suppressed with either urea or calcium cyanamide applied in the fall to tobacco plant beds that were then covered with straw and not seeded until February. Further tests are deemed necessary to determine the manner in which different soil conditions may influence results.

The relation of boron to the root-nodules of *Vicia faba*, J. DUFRENOY. (La. State Univ.). (*Growth*, 4 (1940), No. 4, pp. 323-326, figs. 3).—"The symbiotic relations between the nodule bacteria and their host cells are affected by the supply of boron. The behavior of the mitochondria and the effects of the bacteria on the continuance of the host cells are evidence of the importance of boron for the balance between the partners in symbiosis. A deficiency in a mineral nutrient like boron may cause the invading organisms to live as parasites."

Control of the diseases of vegetable crops, O. D. BURKE and R. S. KIRBY (*Pa. State Col. Ext. Cir.* 173, rev. (1940), pp. 18, fig. 1).

Duas molestias de virus do feijoeiro [Two virus diseases of beans (*Phaseolus vulgaris*)], A. S. COSTA and R. FORSTER (*Biologico*, 7 (1941), No. 7, pp. 177-182, pls. 2).—This paper presents the results of studies of bean mosaic (bean virus 1) and bean yellow mosaic (bean virus 2) as they occur in Brazil.

Spraying and dusting lima beans on Long Island, H. S. CUNNINGHAM (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 5-6, fig. 1).—A brief summary of recent observations and studies showing that diseases and pests may be readily held in check with well-timed sprays and dusts. Comparisons of several bordeaux formulas with fixed copper preparations indicated very little difference in effectiveness among them.

Prevention of rotting of melons in transit is purpose of tests undertaken by station, W. A. KREUTZER and D. P. GLICK (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 4, pp. 8-9, fig. 1).—This note reports a rotting of honeydew melons showing up in transit and found due to anthracnose (*Colletotrichum lagenarium*). It is believed that the inoculum came from use of washing tanks and belts for some days without disinfection.

Experiments in control of onion-smut (*Urocystis cepulae* frost), J. G. GIBBS, G. T. S. BAYLIS, and L. BLACKMORE (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 3A, pp. 162A-166A, fig. 1).—In tests of formalin drip treatments, all reduced infection by 50-75 percent. No single formula was outstanding in efficacy, but 1-1.6 percent was in general superior to 0.8 percent formalin. Formaldehyde dusts, Agrosan, Ceresan, calomel, and lime-sulfur, as well as attempts at eradication by chemical disinfection of the soil, all proved unsatisfactory.

Reaction of pea varieties to *Septoria pisi*, W. J. ZAUMEYER. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 1, pp. 64-70).—*S. pisi* was inoculated into 134 strains and varieties of peas in the field (1936-39) to determine their relative resistance and susceptibility. Only 2 varieties exhibited a very high degree of tolerance, particularly canning strains of the Perfection type. In general, the earlier varieties were more susceptible and the later varieties more tolerant.

Cuprous oxide as a seed protectant for peas, L. OGILVIE, H. E. CROXALL, and C. J. HICKMAN (*Univ. Bristol. Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1939, pp. 88-99).—Previous literature (18 references) on pre-emergence damping-off and its control by cuprous oxide is reviewed. Greenhouse and field tests indicated that an increased emergence of seedlings under certain environmental conditions may be obtained by such treatment of seeds, comparing favorably with organic mercurials. Evidence is presented that cuprous oxide may retard the rate of seedling emergence, and in dry soils may injure certain varieties.

Doenças do tomateiro no nordeste [Tomato diseases in northeastern Brazil], J. A. DESLANDES (*Bol. Soc. Brasil. Agron.*, 3 (1940), No. 4, pp. 443-452, figs. 12).—A brief conspectus of the diseases and their control.

Curly top control methods, M. SHAPOVALOV. (Utah Expt. Sta. coop. U. S. D. A.). (*Utah Agr. Col. Ext. [Cir.] 109 n. ser.* (1941), pp. 24-25).—A progress report of tomato investigations on this virus disease.

Protecting orchard crops from diseases and insects in eastern New York, C. R. CROSBY, W. D. MILLS, and J. A. EVANS (*N. Y. State Col. Agr., Cornell Ext. Bul. 314, rev.* (1941), pp. 101, figs. 26).

Pot experiments on bitter pit of apples, T. WALLACE and J. O. JONES (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1939, pp. 79-84).—Injection tests with various "major" and "minor" elements and citric acid were carried out on potted apple trees (Bramley Seedling) to study any possible relationships with bitter pit. This trouble was severe under all treatments, and it is concluded that the elements and compounds concerned would be ineffective in control. Of the elements used, only Co and Ni caused appreciable injury to the trees. Field tests also indicated the ineffectiveness of boric acid and iron citrate for controlling bitter pit and cork in pears.

Notes on the use of certain sulphur preparations in apple spraying, R. W. MARSH (*Univ. Bristol., Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt.*, 1939, pp. 42-51).—The types, properties, and applications of a number of sulfur sprays are briefly described, and their usage in the United States is discussed. The few published results of trials in England indicate that the sulfur pastes and dusts are somewhat inferior to lime-sulfurs yielding equivalent S deposits. Though lime-sulfur is usually more phytocidal, the other sulfur products do not obviate spray damage.

Peach tree injury, F. P. CULLINAN. (U. S. D. A.). (*Va. State Hort. Soc. Rpt.*, 45 (1940), pp. 111-117).—Notes on winter injury, with special reference to collar injury in 1940 in Maryland and Virginia.

Notes on the incidence of plum bacterial canker in relation to methods of propagation, R. W. MARSH and T. SWARBRICK (*Univ. Bristol. Agr. and Hort.*

Res. Sta., Long Ashton, Ann. Rpt., 1939, pp. 85-87).—Tentative conclusions from the observations recorded are that in low-worked trees Kentish Bush is a satisfactory rootstock for both Victoria and Giant Prune, and the latter on this rootstock showed marked resistance to bacterial canker. Giant Prune top-worked on young Pershore trees made satisfactory growth, but top-working of Victoria on Pershore gave trees lacking vigor.

Red core disease of the strawberry, R. D. REID (*Scot. Jour. Agr.*, 23 (1941), No. 3, pp. 264-272).—This is a historical and general account of the disease due to *Phytophthora fragariae*, with special reference to its occurrence and importance in Great Britain. After 8 yr. of test and the gradual elimination of unsatisfactory seedlings, five varieties have been released which are said to be very highly resistant to this disease, though less satisfactory with respect to virus diseases. The fruiting characters of these varieties are summarized.

Angular leaf spot of Muscadines, caused by *Mycosphaerella angulata* n. sp., W. A. JENKINS. (Ga. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 1, pp. 71-80, figs. 2).—Studying the symptomatology and etiology of the disease here designated "angular leaf spot" for two seasons, the lesions were found to appear first as small chlorotic areas on the upper leaf surface, rapid development resulting in the production of lesions visible on both leaf surfaces and surrounded by halos on the upper surface. The halos tended to disappear with age. The disease is believed to be coextensive with muscadine culture in the Southeast. The pathogen was observed producing spermogonia and perithecia in addition to conidia of the previously known *Cercospora brachypus*. The perfect stage, apparently not previously described, is designated *M. angulata* n. sp. Results from one season's work indicate that infection may be controlled by properly timed applications of a 4-5-50 bordeaux spray, and strict vineyard sanitation may prove an important supplement. On the basis of observation alone, it is suggested that judicious selection of resistant breeding stock may be expected to produce more resistant progenies of superior-quality muscadines.

O tratamento da leprose dos citrus [Control of citrus leprosis], A. A. BITANCOURT (*Biologico*, 7 (1941), No. 6, pp. 149-152).

A poda da laranjeira no tratamento da leprose [The pruning of orange trees for leprosis control], S. FRANCO DO AMARAL (*Biologico*, 7 (1941), No. 7, pp. 183-186, figs. 4).

A podridão das radículas dos citrus na Provincia de Corrientes, Argentina [Root rot of citrus in the Province of Corrientes, Argentina], A. A. BITANCOURT (*Biologico*, 6 (1940), Nos. 10, pp. 285-288; 12, pp. 356-364, pls. 4, fig. 1; 7 (1941), No. 3, pp. 62-69).—This presents a general study of the disease, including its history, geographical distribution, symptoms, species of citrus affected, theories as to the cause, and treatment by inarching and grafting.

La verrucosis de los citricos [Citrus verrucosis], G. L. FAWCETT (*Rev. Indus. y Agr. Tucumán*, 30 (1940), No. 10-12, pp. 227-229, figs. 3).—A note on sour orange scab and sweet orange fruit scab and their control in Argentina.

The establishment of a home-made cuprous oxide mixture as a citrus fungicide in southern Queensland, F. W. BLACKFORD (*Queensland Agr. Jour.*, 56 (1941), No. 1, pp. 4-33, figs. 3).—In citrus field experiments with a cuprous oxide mixture prepared from CuSO_4 , NaOH , and molasses or honey in comparison with bordeaux mixture, the former did not seem to injure the trees in the manner commonly associated with bordeaux, and brown spot (*Gloeosporium* sp.) black spot (*Phoma citricarpa*), melanose (*Diaporthe citri*), and scab (*Sphaceloma fawcettii scabiosa*) were satisfactorily controlled. By modifying the

original formula the mixture may be added to sprays containing soaps and/or white oil. Trees sprayed with the cuprous oxide mixture may be fumigated sooner after spraying than when bordeaux is used. Comprehensive spray schedules for Queensland are presented. There are 32 references.

Brown rot control and copper injury: Report of a field experiment on lemons, H. I. MORRIS, L. J. KLOTZ, and V. P. SOKOLOFF. (Calif. Citrus Expt. Sta. et al.). (*Calif. Citrog.*, 26 (1941), No. 10, p. 284, fig. 1).—Experiences with different concentrations of bordeaux spray indicated that thorough coverage with a dilute mixture (1-1-100) will give satisfactory control of brown rot on lemons, and though adding 5 lb. of ZnSO₄ failed to increase its fungicidal effectiveness it did in some manner decrease the tendency to Cu injury. Analytic data showed that injuries to the rind surface are associated with high Cu content of the necrotic tissue derived presumably from the Cu sprays.

Diseases affecting species Delphinium, T. LASKARIS (*Delphinium [Amer. Delphinium Soc.]*, 1940, pp. 68-74, figs. 4).—Brief notes on some eight diseases, with special emphasis on a progress report of work on the *Sclerotium delphinii* crown rot and its control.

A new bacterial disease of poinsettia, P. P. PIRONE and T. R. BENDER (*New Jersey Stas. Nursery Disease Notes*, 14 (1941), No. 4, pp. 13-16).—This disease, shown to be due to an undetermined species of bacterium, is reported to be more destructive than the *Rhizoctonia* stem rot which hitherto has been the most serious disease of poinsettia.

Os mosaicos da roseira no Estado de S. Paulo [Mosaics of roses in São Paulo, Brazil], M. KRAMER (*Biologico*, 6 (1940), No. 12, pp. 365-368, pls. 2).—On rose mosaic and rose yellow mosaic.

A virosis-like injury of snapdragon caused by feeding of the peach aphid, K. F. BAKER and C. M. TOMPKINS. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 1, pp. 93-95, fig. 1).—Both under greenhouse and field conditions in California, *Myzus persicae* was found to cause a virosislike injury of the terminal growth of *Antirrhinum majus*, resulting in a reduction in size and frequent distortion of the leaves, accompanied by yellow or white blotches or spots usually along the midribs near the leaf bases. The symptoms were also observed on five other species of *Antirrhinum* and on *Linaria dalmatica*. That the condition was not virus-induced was indicated by the facts that when freed of aphids new growth from injured plants was normal, that a nonviruliferous line of aphids induced typical injury, and that only the leaves fed upon exhibited the abnormal condition.

Tulip fire (Botrytis tulipae), a disease new to the country, J. B. MARCHIONATO (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), No. 7-8, p. 133M).—A note on this disease of tulip in Argentina.

A Xylaria pathogenic to Ginkgo biloba L. seeds, S. H. DAVIS, JR., and J. B. HARRY (*Phytopathology*, 32 (1942), No. 1, pp. 91-93, figs. 2).—A fungus isolated from dying ginkgo branches was identified as *X. longeana*. Inoculating it into sterile and nonsterile soil at the time of sowing ginkgo seeds resulted in about 95 percent pre-emergence loss, and survivors produced only stunted seedlings.

Bleeding canker of maples, N. CAROSELLI and F. L. HOWARD. (R. I. Expt. Sta.). (*Bartlett Tree Res. Labs. Bul.* 3 (1939), pp. 44-48, figs. 3).—This paper is a summary of the authors' work on the disease first noted about 1930 and shown by them to be due to *Phytophthora cactorum*. The distribution, maple species attacked, and etiology are here considered.

Antidoting toxin of Phytophthora cactorum as a means of plant disease control, F. L. HOWARD. (R. I. Expt. Sta.). (*Science*, 94 (1941), No. 2441, p. 345).—Over 350 maple (?) trees, naturally infected by the bleeding canker

fungus, after injection with 0.5 percent aqueous solution of the dihydrochloride salt of diaminoazobenzene plus a solvent and penetrant ("Helione orange") stopped "bleeding" and showed marked improvement in vegetative growth. This chemical, when added to the toxic filtrate from cultures of the fungus, prevented injury from its injection into healthy trees. Whether the chemical will eliminate infection from trees is not yet known.

Distribution and suggested control measures for the southern pine fusiform rust, H. LAMB and B. SLEETH (*U. S. Dept. Agr., Forest Serv., South. Forest Expt. Sta. Occas. Paper 91 (1940), pp. [2]+5, fig. 1.*)—This paper summarizes the situation. Slash and loblolly pines and the black oak group are said to be the most susceptible to the pine-oak rust (*Cronartium fusiforme*), the approximate range of which in the Southeastern States is discussed and mapped. The mortality from infection is highest in the pine seedling stage and least in the mature stand. Control depends mostly on the prevention of infection in the nursery and removal of cankered branches from young trees in the field before infection reaches the trunks.

Some nematodes of the family Tylenchidae which do not possess a valvular median esophageal bulb, G. THORNE. (U. S. D. A.). (*Great Basin Nat., 2 (1941), No. 2, pp. 37-85, pls. 9.*)—"The collection of nematodes on which this paper is based has accumulated at the Salt Lake City Station of the Division of Nematology during the past 20 yr. These specimens have been secured from the great quantity of plant and soil material submitted for examination and identification by various State, Government, and private agencies and from the extensive faunistic collections made at this station." New taxonomy and keys to the groups are included. There are 23 references.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Game bird investigations: Quail and chukar partridges, E. M. FUNK, J. C. HAMILTON, and H. L. KEMPSTER (*Missouri Sta. Bul. 435 (1941), pp. 16, figs. 7.*)—In experiments conducted in 1938 and 1939 on the effect of all-night light on quail and chukar partridges the total egg production of these fowl was increased. The larger egg production for the lighted birds was attributed to a longer laying period due to early egg production and also to a higher rate of production. The results obtained on variation between individual quail suggest the possibility of breeding for increased fertility and hatchability. Based on a single trial, flock matings of chukar partridges produced more satisfactory results than did mating in pairs. Best results were obtained when one male was mated to four females. In captivity a male quail will mate with more than one female. Eggs from flocks where one male was mated with two females showed a fertility of 97.97 percent. Maintaining breeding chukar partridges on earth floors resulted in a higher percentage of fertility and hatchability than was experienced when birds were maintained on wire floors. Chukar partridges produced eggs of average size after the first week of laying. Quail laid eggs of average size in their fifth week of laying. Hot weather apparently does not have the depressing effect on egg weight in quail and chukar partridges which is experienced in chickens. Quail and chukar partridge eggs increased in size each succeeding month, whereas the weight of chicken eggs declined to a low point in July. The weight of chukar partridge and quail eggs was influenced by the position of the egg in the clutch. The largest egg was usually the first egg in the clutch. Results indicated that an increase of egg production in quail and chukar partridges was accompanied by an increase in the size of clutch. The average chukar partridge egg was 22.37 gm. in weight, 4.207 cm. in length, and 3.154 cm. in width. The average quail egg was 9.13 gm. in weight, 3.095 cm. in length, and 2.401 cm.

in width. Chukar partridges under all-night lights consumed an average of 5 lb. of feed per pair for each month of the breeding season. The unlighted birds ate an average of approximately 4 lb. of feed per pair for each month. Each pair of all-night lighted quail ate 2.15 lb. of feed, whereas each pair of unlighted quail ate 2.05 lb. per month.

The handbook of British birds, I-V, H. F. WITHERBY, F. C. R. JOURDAIN, H. F. TICEHURST, and B. W. TUCKER (*London: H. F. & G. Witherby, 1938, vols. 1, pp. XL+326, pls. [33], figs. [54]; 2, pp. XIII+352, pls. [30], figs. [48]; 1939, vol. 3, pp. X+387, pls. 39, figs. [53]; 1940, vol. 4, pp. XIV+461, pls. [33], [figs. 85]; 1941, vol. 5, pp. XII+356, pls. 22, [figs. 72]*).—This work, which succeeds *A Practical Handbook of British Birds*, issued from 1920 to 1924 (E. S. R., 51, p. 54), has been largely rewritten (in five volumes), remodeled, and much new matter added, more especially on the life history of the birds. Volume 1 takes up crows to flycatchers; 2, warblers to owls; 3, hawks to ducks; 4, cormorants to cranes; and 5, terns to game birds. Included in volume 5 are additions and corrections to the work, a systematic list of British birds, and indexes.

The role of territory in bird life, M. M. NICE (*Amer. Midland Nat.*, 26 (1941), No. 3, pp. 441-487).—Presented with a bibliography of 16 pages.

Investigations in economic zoology and entomology by the Alabama Station (*Alabama Sta. Rpt. 1940, pp. 42-43, 44-45*).—This report notes progress (E. S. R., 85, p. 499) in studies on the relative efficiency of rotenone-containing insecticides in the control of vegetable-crop insects, by F. S. Arant; the fumigation of camellias and azaleas with methyl bromide, by L. L. English; and farm fish ponds, by H. S. Swingle and E. V. Smith.

The endocrine control of insect development, E. T. BURTT (In *Abstracts of Dissertations Approved for the Ph. D., M. Sc., M. Litt. Degrees in the University of Cambridge During the Academical Year 1939-1940. Cambridge, Eng.: Univ. Press, 1941, pp. 21-22*).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 859-861).—Contributions presented (E. S. R., 86, p. 352) are: Susceptibility of Resistant and Nonresistant Strains of the California Red Scale to Sprays of Oil and Cube Resins, by A. W. Cressman (p. 859) (U. S. D. A.); Chemical Control of *Pseudococcus comstocki* Kuw., by W. M. Upholt (pp. 859-860) (S. C. Expt. Sta.); Control of the Euonymous Scale, by L. Pyenson (p. 860); and Action of Derris and Rotenone on the Firebrat, by C. H. Richardson and E. J. Seiferle (pp. 860-861) (Iowa Sta.).

[Work in economic entomology by the Colorado Station] (*Colorado Sta. Rpt. 1941, pp. 23-26*).—The work of the year (E. S. R., 84, p. 642) relates to a cactus-destroying insect, *Moncilema annulata* Say and its control, insect transmission of peach mosaic, insecticide tests with cucurbit insects, and effect of treatments for psyllid infestations of tomatoes on spoilage in storage.

Current contributions on insect control (*New York State Sta. Bul. 698 (1942), pp. 62, figs. 9*).—Included are the following: Present Status of the Mineral Oil Treatment for Corn Ear Worm Control, by L. A. Carruth (pp. 3-5); The Status of Biological Control of the Japanese Beetle in New York State, by E. H. Smith and D. M. Daniel (pp. 6-9); Pyrethrum Dusts for the Control of the Apple Redbug, by R. W. Dean (pp. 10-11); The Use of Concentrated Sprays for Pea Aphid Control, by H. Glasgow (pp. 12-14); Blood Albumin for Use as an Emulsifier, by G. W. Pearce and P. J. Chapman (pp. 15-16); Contributions to Codling Moth Control, by S. W. Harman (pp. 17-19); Squash Vine Borer Control, by G. E. R. Hervey (pp. 20-21); Dormant Treatments for the Control of Certain Insects on Nursery Plants, by F. L. Gambrell (pp. 22-25);

Relation of Oil Deposits to the Control of the Oriental Fruit Moth on Quinces, by E. H. Smith, A. W. Avens, and S. C. Mendall (pp. 26-28); Insecticidal Control of the Raspberry Cane Borer, by F. G. Munding (pp. 29-30); Pea Aphids as a Factor in Growing Peas on Long Island, by H. C. Hockett (p. 31); A Shortened, Intensive Summer Spray Program for Apples in Eastern New York, by O. H. Hammer and D. W. Hamilton (pp. 32-34) (coop. U. S. D. A.); Use of Dusts for European Corn Borer Control, by L. A. Carruth (pp. 35-39); A New Basis for Selecting Petroleum Oils for Orchard Sprays, by P. J. Chapman, G. W. Pearce, and A. W. Avens (pp. 40-42); Recent Investigations on Cherry Fruitflies [Cherry Fruitfly and Black Cherry Fruitfly], by D. W. Hamilton (pp. 43-44) (U. S. D. A.); Studies on the Control of the Grape-Berry Moth, by E. F. Taschenberg and F. Z. Hartzell (pp. 45-47); Studies of Rotenone Sprays for Cabbage Worm Control, by G. E. R. Hervey (pp. 48-50); Recent Experiments to Control the Scurfy Scale, by O. H. Hammer (pp. 51-52); Insecticides for Oriental Fruit Moth Control, by R. W. Dean and E. H. Smith (pp. 53-54); Field Identification of Five Leaf Rollers [the Fruit Tree Leaf Roller, *Pandemis limitata* Robinson, the Oblique-Banded Leaf Roller, *Eulia quadrifasciana* Fern., and *E. velutinana* Walk.] Found in Apple Orchards, by D. E. Greenwood (pp. 55-58); and Pre-foliage Treatments for Control of [Eye-Spotted] Bud Moth, by F. Z. Hartzell (pp. 59-62).

The effect of host density on the rate of reproduction of entomophagous parasites, P. DE BACH and H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 741-745, fig. 1).—Using housefly puparia distributed at random in a container filled with barley, an investigation was made of the success of two species of parasites, *Mormoniella vitripennis* (Walk.) and *Muscidifurax raptor* Gir., in the search for hosts. It was demonstrated that *Mormoniella* found hosts at a rate which increased with increasing host density, but which was not constant and which finally approached a fixed rate asymptotically. This deceleration of the rate at which discovery increased with host density appeared to be caused by the increasingly greater proportion of time spent in nonsearching activities as the host density increased. These nonsearching activities are mainly oviposition, feeding, and resting. *Muscidifurax* has such great searching ability in comparison with *Mormoniella* that under the conditions of the experiment all the hosts were found at the lower densities. These experiments were restricted to single "generations" and a constant parasite density. The experiment is considered to illustrate the importance of searching capacity, as opposed to potential reproductive capacity, in the determination of a parasite's efficiency.

Studies of insect damage to cotton with reference to soil-conservation practices, P. A. GLICK and K. P. EWING. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 737-741).

Isolation-cage studies of certain hemipterous and homopterous insects on sugar beets grown for seed, O. A. HILLS. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 756-760, figs. 2).—Surveys of fields of sugar beets grown for seed in Arizona having indicated the presence of certain insects likely to be of economic importance in the Southwest, cage studies were conducted in 1938 and 1939. These revealed that *Lygus* spp., Say's stinkbug, and *Thyanta custator* (F.) are capable of materially reducing the percentage of viable sugar beet seed produced per plant. The number of seed balls was not reduced by these insects, but the seed was slightly lighter in weight, as was indicated by a reduction in weight per unit of volume. The false chinch bug up to 500 per plant had no measurable effect on the quantity or quality of seed produced. Heavy infestations of the green peach aphid in cages drastically reduced the quantity of seed produced but did not significantly reduce the viability.

Boll weevil and cotton aphid control by the use of derris in combination with calcium arsenate, C. F. RAINWATER and F. F. BONDY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 733-735).—Report is made of identical experiments conducted at Florence, S. C., State College, Miss, Tallulah, La., and Waco, Tex., in 1940 in which four insecticides or combinations of insecticides were tested against the bollweevil and the cotton aphid. Calcium arsenate was tested with and without derris at the rate of 6 lb. per acre per application and equal parts of calcium arsenate and sulfur with and without derris at the rate of 12 lb. per acre per application. Eight effective applications were made at each location. Analysis of the data showed that there was no significant difference in the degree of bollweevil control between any two insecticides and that each insecticide was significantly better than the check. Aphid population counts showed highly significant differences favoring the insecticides which contained derris over those which did not. Yield records showed that calcium arsenate plus derris was significantly better than calcium arsenate alone.

A method of stimulating airplane application of insecticides to tall plants in experimental plots, O. A. HILLS and V. E. ROMNEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 853-856, figs. 5).—The equipment and technic developed for use in the application of any insecticide by airplane to sugar beets grown for seed, as in the Salt River Valley of Arizona, are described.

The distribution of sodium arsenite and diluent in the dust cloud, E. HASTINGS and J. H. PEPPER. (Mont. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 769-772, fig. 1).—Report is made of an investigation of the purely physical manner in which a dust diluent of sodium arsenite may affect its value as a contact insecticide for the mormon cricket. The work conducted has led to the conclusion that no interaction took place between the diluents and the active ingredient used, and further that the composition of a dust cloud obtained from the use of the mixed dusts is dependent upon particle size. However, if densities of the materials in a dust mixture varied considerably this, as well as particle shape, would have to be considered.

Some recent advances in the chemistry and physics of spray oils and emulsions, W. M. HOSKINS. (Univ. Calif.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 791-798, figs. 2).—Summarizing the discussion presented, it is pointed out that an increasing number of synthetic wetting and emulsifying agents are available, most of which are of doubtful value in oil sprays because they reduce deposit. Under the influence of solubilizing agents oil becomes soluble to a marked extent in aqueous solutions, and the same phenomenon occurs with "insoluble" substances in oil as a solvent in the presence of the proper solubilizer. The spreading of oil upon water is promoted, and penetration into foliage is retarded by small concentrations of semipolar compounds. On the other hand, inert hydrocarbons such as oils seem to assist semipolar toxic compounds, for instance alcohols, in penetrating insect integument. Lastly, oxidation of unsaturated hydrocarbons to form complex acids is chiefly responsible for leaf injury. The unsulfonatable residue test is not always a satisfactory criterion for estimating the tendency to oxidize, but a practical substitute test is yet to be found.

See chemical composition of oils affecting efficiency, P. J. CHAPMAN, G. W. PEARCE, and A. W. AVENS (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 1, 3, fig. 1).—A practical account, continuing previous work (E. S. R., 86, p. 215).

Methods of measuring spray oil deposits, A. W. CRESSMAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 798-804, figs. 2).—A review of various methods of measuring deposits of spray oils has shown that all except one colori-

metric analysis involve extraction of the oil from the sprayed surface with a suitable solvent, evaporation of the solvent, and either volumetric or gravimetric measurement of the extracted oil. Both whole leaves and disks of known area have been used. Although the distribution of oil may not be uniform over the whole leaf, the disk method of sampling is considered adequate for measurement of relative results. Rapid loss of oil following application of field sprays necessitates either prompt extraction or storage of samples at low temperatures. It is doubtful whether relative deposits in field sprays can be inferred directly from laboratory measurements, since differences in the surfaces or conditions of application may change the relative quantities of oil deposited by different sprays.

Physiological effects of petroleum oil sprays on citrus, P. W. ROHRBAUGH (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 812-815, figs. 6).—It is pointed out that the injurious effects of petroleum spray oils on citrus are now considered to be largely due to two factors. The first factor is a chemical burning by the unsaturated hydrocarbon molecules or other toxic molecules in the oil. The second factor in injury to citrus by oil sprays seems to be the result of the plugging of the intercellular spaces and the surrounding of the plant cells with oils which prevent the movement of gases such as carbon dioxide and oxygen out of and into the cells.

Solubilizers for petroleum oils and extracts of rotenone-bearing roots, J. F. KAGY and A. M. BOYCE, (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 804-811, figs. 5).—A method for the determination of the miscibility of ternary systems, rotenone-bearing extracts—petroleum oils—solubilizers, is prescribed. "For any solubilizer a series of plait points were determined experimentally. By plating these values on triangular coordinate paper, curves are obtained which delimit homogeneous and heterogeneous mixtures. Three-component solubility curves have been determined for systems of a light-medium oil—derris extract (33 percent rotenone)—solubilizers that are representative of different chemical classes. The solubilizers included in the study were diphenyloxide, oil of sassafras, methyl-*n*-amylketone, dibutylphthalate, 2(4-*tert.* butylphenoxy) ethanol, Cardolite, and diamylphenol. The effect of the grade and unsulfonatable residue (U. R.) of the petroleum oil on the miscibility of the three components of the ternary systems has been determined. The lower the U. R. value of the same grade of oil the greater the amount that can be added to a given solution of solubilizer plus extract. The more volatile fractions of the kerosene grade have greater relative compatibility with extract-solubilizer solutions than the heavier fractions. It has been found that the compatibility of extracts of rotenone-bearing roots that differ in source is not a function of the rotenone content. Chemically pure rotenone is much more soluble in solutions of a light-medium petroleum oil and 2(4-*tert.* butylphenoxy) ethanol than similar quantities of rotenone in the presence of the other constituents of the extract. It has been suggested that some constituent in the extract other than rotenone is the chief factor in determining the compatibility of the mixtures.

"The desirability of knowing the composition of the phases that separate in the state of heterogeneity of the systems has been stressed. Within certain ranges of concentrations of the systems a phase separates what appears to be one or more of the ethylenedichloride-soluble resins of the root. Toxicological evidence points to the fact that certain heterogeneous compositions are effective for the control of certain insects, possibly because the active constituents of the extract are in solution.

Physiological and physical effects of spray oils on deciduous trees, P. A. YOUNG. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 838-844).—

A brief review is given of all available parts of the extensive recent literature on the effects of petroleum and tar oils on sprayed plants, especially deciduous fruits, together with a list of 59 references. Herbaceous plants are mentioned for comparison and accessory information.

Toxicants used with petroleum oil sprays for deciduous fruits, L. M. SMITH. (Univ. Calif.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 844-853).—The toxicants used with petroleum oil sprays here considered are grouped into (1) insecticides of plant origin, (2) synthetic organic insecticides, and (3) inorganic insecticides. A list of 74 references is included.

Materials added to oil spray to increase its effectiveness in citrus pest control, W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 829-837).—Materials increasing the effectiveness of oil spray (1) by physical and (2) by chemical means are dealt with. Materials added to oils may result in improvement of the resulting sprays by (1) making possible the treatment of two pests requiring different insecticides with one spray treatment, (2) increasing the effectiveness of the spray because of the additive effect of the independent actions of two or more insecticides, (3) increasing the effectiveness of the spray because of the apparent synergistic action often resulting from combinations of certain compounds with oil even though these compounds may by themselves have little or no insecticidal value against the pest in question, and (4) by making possible the penetration of compounds which have a high independent toxicity but are not able to penetrate to the insect or into its body. Examples of materials added to petroleum oil spray which have been used either experimentally or in actual citrus pest control practice are (1) cryolite in orange tortrix and *Holcocera iceryaella* control, (2) Selocide and wettable sulfur in citrus red mite control, (3) various sulfur compounds in citrus red mite and citrus bud mite *Eriophyes sheldoni* control, (4) lime-sulfur used with miscible oil in control of unarmored scale insects and citrus red mite, (5) nicotine sulfate in greenhouse thrips control and nicotine in California red scale control experiments, (6) pyrethrum in greenhouse thrips control, (7) dinitro-*o*-cyclohexylphenol in scale control experiments, (8) Lethane in black scale and California red scale control experiments, (9) preparations including ground rotenone-bearing roots in black scale control, and (10) the extractives of rotenone-bearing plants incorporated into oil by means of solubilizers and used in the control of scale insects.

Comparative effects of oil spray and hydrocyanic acid fumigation on the composition of orange fruits, W. B. SINCLAIR, E. T. BARTHOLOMEW, and W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 821-829, fig. 1).—It was found that the spraying of citrus trees with light-medium oils in concentrations of 0.25 to 1.75 percent caused a reduction in the total soluble solids and in reducing and total sugars of the fruit juice. Oil sprays with and without the toxicants were equally effective in reducing the soluble constituents in the fruit. Although oil spray had a tendency to reduce the titratable acidity, the results were not so decisive as in the case of the other soluble constituents. Since orange juice is highly buffered, the small change in titratable acidity of the juice was not sufficient to produce an effective change in pH of the mature fruit. Only slight differences occurred in the composition of the juice of fruits from plats that had been sprayed with 0.75 to 1.75 percent oil. The data show that although the groves of these experiments were widely separated and differed greatly as to environmental conditions and soil types, the change effected by the spray in chemical composition of the fruit was practically the same. The time of the year at which the oil was applied was found to be relatively unimportant. The fumigation of citrus trees with HCN

either in the fall or in the winter had no marked effect on the chemical composition of the mature fruit.

Factors affecting the absorption and retention of hydrocyanic acid by citrus leaves and fruits, E. T. BARTHOLOMEW, W. B. SINCLAIR, and D. L. LINDGREN. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 815-821, figs. 5).—It was found that green and mature fruits absorbed decreasingly less HCN when preconditioned overnight at 43°, 50°, 65°, and 80° F. Fruits sprayed with a 1 percent oil spray in the laboratory absorbed less HCN than unsprayed fruits, but similar tests with a 1.5 percent oil spray in the field showed no appreciable difference. Turgid fruits and leaves absorbed more HCN than nonturgid fruits and leaves under field conditions, but not under laboratory conditions. Fruits from coastal areas absorbed more HCN than similar fruits from inland areas in 1939-40 but less in 1940-41. In both years, however, the coastal fruits were more seriously injured than the inland fruits. The amounts of HCN absorbed by fruits and leaves when fumigated under field conditions during the day or at night were approximately the same, but fruits and leaves fumigated during the day were much more severely injured than those fumigated at night. These results indicate that the stomata are not a controlling factor in HCN absorption. Whether or not the fumigated tissues will be injured appears to be governed by the physiological condition of the tissues more than by the amount of HCN absorbed.

The behavior of hydrocyanic acid gas under a fumigation tent, R. A. FULTON, R. L. BUSBEY, and H. R. YUST. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 777-783, figs. 5).—A study of the behavior of HCN gas under a form tent over an orange tree, its distribution being determined by various methods, is reported upon. It was found that all the methods produced locations of low concentration, especially near the periphery of the tent. The concentration of the gas varied sufficiently to produce significant differences in mortality of scale insects. A means for reducing this variation by first diluting the HCN with air by means of a blower inside the tent was developed. This improvement is supported by chemical analyses and by the tests of mortality of scale insects placed at several locations in the tent. Adequate distribution of the gas was also obtained with the dilution device when trees in a lemon grove were covered with regular fumigation tents.

Preliminary experiments on the silverfish *Ctenolepisma urbani* Slabaugh, A. MALLIS. (Univ. Calif.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 787-791).—Report is made of a study of the behavior of *C. urbani* as related to means for its control.

Laboratory control studies on the greenhouse thrips, B. R. BARTLETT and C. O. PERSING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 760-766).—In laboratory control studies of the greenhouse thrips on the Valencia orange, tests were made of a number of sprays and dusts against the adult stage at concentrations likely to be practicable for field usage on citrus. The adults were readily killed by a number of materials in sprays and dusts. Pyrethrum was extremely toxic, and sprays containing nicotine sulfate and dusts of 2,4-dinitro-6-cyclohexylphenol were also very effective. Certain antimony and fluorine stomach poisons used with sucrose were tested on the adult stage, and none was found to be effective enough to offer much promise. The antimony compounds were more effective than the fluorine materials, and tartar emetic was the most promising of the antimony compounds.

Various materials were tested against eggs of the greenhouse thrips. A comparison of the effectiveness of certain spray oils shows that an appreciable mortality of eggs occurred when highly refined light-medium petroleum oil was

used at 1.67 percent. Kerosene used at 8 percent had little effect. Comparisons of the effectiveness of spray mixtures of highly refined light-medium petroleum oil with nicotine sulfate solution and pyrethrum extract indicated that pyrethrum extract with petroleum oil was approximately eight times as effective as nicotine sulfate and petroleum oil. Numerous other materials were tested in sprays, with and without oil, against eggs of this species. The most effective materials, other than pyrethrum extract, were 2,4-dinitro-6-cyclohexylphenol and the dicyclohexylamine salt of this compound. A spray mixture containing 0.5 percent of a highly refined light-medium petroleum oil and sulfur was also effective, but sulfur alone was not.

Observations on the biology and control of the treehopper *Heliria praealta* (Fowler) in orchards of the Pacific Northwest, M. A. YOTHERS and P. B. ALLEN, JR. (*U. S. Dept. Agr. Cir. 606 (1941)*, pp. 12, pls. 5, figs. 4).—Studies were made on the biology and control of the membracid *H. praealta* near Wenatchee, Wash., from 1929 to 1934, inclusive. This potential apple pest was first found in the West on apple in 1914. Eggs are deposited throughout July and August in the bark of branches and sprouts of apple trees. The eggs hatch in late April or early May. Nymphs pass through five instars and reach maturity about June 1. Adults are present from the last of May until the first of October. Only one generation occurs annually. Control methods suggested include pruning off the water sprouts, in the base of which most eggs are deposited, and spraying with a 4 percent dormant oil emulsion and possibly the use of an emulsion of nicotine and summer oil for control of the early nymphal stages.

A review of the Aleyrodidae of Mexico, W. W. SAMPSON and E. A. DREWS (*An. Escuela Nac. Cien. Biol. [Mexico]*, 2, (1940), No. 2-3, pp. 143-189, figs. 24).—Fifty-one species of Aleyrodidae are recorded from Mexico, of which 22 are described as new to science. Two new species are described from Panama.

***Matsucoccus bisetosus* Morrison, a potential enemy of California pines**, H. L. MCKENZIE. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 783-785, figs. 3).—A preliminary survey made of the *Matsucoccus* scale insects in the California region indicates that there are a half dozen or more species that appear to be definitely connected with injury to pines, of which *M. bisetosus* appears to be the most important. This preliminary contribution, based upon information gained during the last 2 yr., considers the effect of the scale on pines, occurrence, and its potentialities as a forest problem.

A morphological difference between the California red scale and the yellow scale [*Aonidiella citrina* (Coq.)], H. R. YUST. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 785-787).

The control of black scale in olive orchards by calcium cyanide dusting, A. F. KIRKPATRICK (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 772-777, figs. 5).—Dusting work is reported with calcium cyanide for the control of the black scale in the San Joaquin and Sacramento Valleys of California, where approximately 20,000 acres or 82 percent of the commercial olive trees in the United States are located.

Las cochinillas de los citricos Tucumanos y su control [Scale insects of citrus in Tucumán and their control], K. J. HAYWARD (*Bol. Estac. Expt. Agr. Tucumán*, No. 32 (1941), pp. [2]+29, figs. 17).

Relative effectiveness of acid lead arsenate and other materials as stomach poisons for the larvae of the Japanese beetle, W. E. FLEMING (*U. S. Dept. Agr., Tech. Bul.* 788 (1942), pp. 32, fig. 1).—Toxicity tests were conducted in the laboratory during the period from 1929 to 1936, inclusive, with larvae of the Japanese beetle. Acid lead arsenate was used as a standard of insecticidal activity. Freshly applied arsenates of calcium, magnesium, and manganese

appeared more effective than acid lead arsenate; arsenates of aluminum, barium, ferric iron, and zinc appeared equivalent to acid lead arsenate; and basic lead arsenate showed no insecticidal value. The effectiveness of acid lead arsenate, ferric arsenate, and zinc arsenate decreased rapidly after these arsenicals had remained in the soil for about 2 to 3 yr., while the effectiveness of the other arsenicals appeared to last 1 or 2 yr. longer. With the exception of basic lead arsenate, these arsenicals were more toxic to plants than was acid lead arsenate. Arsenious oxide and arsenious sulfide proved more toxic to larvae than acid lead arsenate and were affected slowly by the soil. Both were toxic to plants. Paris green and its homologues were effective as insecticides but harmful to plant growth. Inorganic borates of calcium, lead, magnesium, nickel, sodium, strontium, and zinc were relatively nontoxic to larvae. Inorganic fluorides of aluminum, barium, calcium, copper, lead, magnesium, strontium, and zinc and natural cryolite were not toxic to the larvae. Fluosilicates of barium, magnesium, potassium, and sodium were equal or superior to acid lead arsenate when freshly applied, but their rapid decomposition in the soil to nontoxic compounds or loss of their insecticidal constituents by leaching makes them unsuitable as substitutes for acid lead arsenate. Calcium fluosilicate was nontoxic. Derris, hellebore, mowrah meal, and pyrethrum were slightly toxic. Fertilizers and soil conditioners such as acid phosphate, ammonium sulfate, ground limestone, hydrated lime, and calcium cyanamide were slightly toxic to larvae. It is suggested that some of these materials might be substituted for acid lead arsenate to kill Japanese beetle larvae in soil under conditions where the effect of the material on vegetation is not a limiting factor. When the susceptibility of the plants growing in the soil to chemical injury is a factor acid lead arsenate appeared to be the safest of the larval poisons.

Control of the locust borer, R. C. HALL. (Coop. Ohio State Univ. et al.). (*U. S. Dept. Agr. Cir. 626 (1942), pp. 19, figs. 14*).—Locust borer control has become more important because of the extensive planting of black locust in the soil conservation programs. These plantings furnish ideal environment for this insect and create conditions favorable for high larval survival and subsequent severe damage. Investigations over a 7-yr. period at Columbus, Ohio, have shown a close relationship between borer damage and tree vigor. Among important factors that reduce tree vigor and increase its susceptibility to borer injury are drought, fire, and grazing of livestock. Silvicultural practices of promise in borer control include clear-cutting, thinning, mulching, mixed planting, and the use of superior varieties of black locust. Clear-cutting is useful in slowly growing stands where later sprout growth developing from stumps is rapid. Thinning is useful in moderately growing stands where the slowly growing and highly susceptible understory trees are removed. Mixed planting is useful for the establishment of new plantations. Mulching is limited to trees of high value. Control other than silvical includes that by natural enemies and by spraying with orthodichlorobenzene, although the latter is considered too expensive for general use.

Methyl bromide fumigation of strawberry planting stock to control *Paria canella* var. *quadrinotata* (Say), G. S. KIDO. (Univ. Calif.). (*Jour. Econ. Ent., 34 (1941), No. 6, pp. 766-768*).—Fumigation control work in 1939-40 with the strawberry rootworm *P. canella quadrinotata*, one of the major pests of strawberries in the central coast and Sacramento districts in California, is reported upon. It was found that on dormant planting stock control may be effected by fumigation with methyl bromide at the rate of 2 lb. per 1,000 cu. ft. for a 3-hr. period or 3 lb. per 1,000 cu. ft. for 2 hr., at a temperature of 72°-74° F. Definite stimulation in growth was noted for the treated plants.

A chemical study of the bearing of decay by *Phellinus cryptarum* Karst. and other fungi on the destruction of wood by the death-watch beetle *Xestobium rufovillosum* De G., W. G. CAMPBELL and S. A. BRYANT (*Biochem. Jour.*, 34 (1940), No. 10-11, pp. 1404-1414).

Prothetely in *Scolytus multistriatus* Marsham (Coleop.: Scolytidae), R. L. BEARD and P. P. WALLACE. (Conn. [New Haven] Expt. Sta.). (*Ent. News*, 52 (1941), No. 9, pp. 242-244, fig. 1).

Field studies of insecticides used to control cabbage caterpillars in the South, W. J. REID, JR., C. E. SMITH, L. B. REED, and W. A. THOMAS (*U. S. Dept. Agr., Tech. Bul.* 782 (1941), pp. 36, figs. 7).—Results indicate that a derris dust mixture containing from 0.5 to 1 percent rotenone is sufficiently toxic to the three most important species of cabbage caterpillars in the South, the cabbage looper, imported cabbageworm, and diamondback moth, to be of value as a substitute for arsenical insecticides in their control. Pyrethrum powder diluted to contain not less than 0.1 percent of pyrethrin I is of considerable value when directed against the cabbage looper and of some value against the imported cabbageworm. Derris and pyrethrum powders were found relatively ineffective against the Agrotinae (the corn earworm and several species of true cutworms) that are sometimes pests of cabbage and related crops. Cryolite, calcium arsenate, and paris green were effective against the Agrotinae, cryolite against the cabbage looper, calcium arsenate against diamondback moth larvae, and paris green against the imported cabbageworm. Hellebore was relatively ineffective against all species.

Studies on the control of cabbage caterpillars with derris in the South, W. J. REID, JR., C. E. SMITH, L. B. REED, and C. O. BARE. (Coop. La. and S. C. Expt. Stas.). (*U. S. Dept. Agr. Cir.* 615 (1942), pp. 27, figs. 9).—The effectiveness of from one to five applications of a derris-clay dust (0.5 percent rotenone) for reducing caterpillar injury and damage and in increasing the yield of marketable cabbage was studied in a series of nine experiments at Baton Rouge, La., and Charleston, S. C., from the fall of 1935 through the spring of 1937. The principal insects involved were the cabbage looper, diamondback moth, imported cabbageworm and corn earworm. Where spring crops were planted it did not prove profitable to apply the dust until shortly before the beginning of harvest. In the four spring-crop experiments the increase in yield due to the most efficient treatments after allowing for experimental error was at least from 0.8 to 1.79 tons of U. S. grade No. 1 cabbage and the net profit at least from \$14 to \$29 per acre. Fall-crop experiments in 1935 showed a need for the protection of plants against the corn earworm and climbing cutworms during the preheading stages of growth with more toxic material than derris. These experiments indicated the need for protection against the cabbage looper and imported cabbageworm during the heading period and at least a portion of the harvesting period. Five applications of arsenical dusts and one of a poisoned bait followed by two of derris dust provided commercially adequate caterpillar control at Charleston in the 1936 fall-crop experiment and resulted in an increase of at least 1.3 tons of U. S. grade No. 1 cabbage per acre. These investigations indicated a need for similar studies of dusts of greater rotenone content and of the effects of more frequent applications.

Wattle bagworm control by aeroplane dusting, T. J. NAUDÉ, L. B. RIPLEY, and B. K. PETRY (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 206 (1939), pp. 12).—The application of airplane dusting in the control of the wattle bagworm *Acanthopsyche junodi* Heyl. in Natal proved entirely practicable with commercial aircraft available in the Union of South Africa. "The kill in spite of the somewhat crude apparatus employed was well over 95 percent in

the part of the demonstration where normal cryolite dust was used, which must be considered as highly satisfactory. Through this improved method of distribution an application of 20 lb. per acre proved fully as effective as 30 lb. or more applied from the ground by means of power dusters, thus making a very material saving in insecticide possible in favor of airplane dusting. The total cost per acre of airplane dusting, even at a distance of 11 miles from the flying base, compares very favorably with that of ground dusting, the former being between 7 and 8 shillings per acre while the latter costs between 8 and 9 shillings."

Further studies on gustatory reactions of the wattle bagworm *Acanthopsyche junodi* Heyl., L. B. RIPLEY, B. K. PETTY, and P. W. VAN HEERDEN (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 205 (1939), pp. 20, figs. 8).

Insecticides for bud moth control, F. Z. HARTZELL (*Farm Res. [New York State Sta.]*, 8 (1942), No. 1, pp. 6, 8).—A practical account.

Secondary hosts of the pink bollworm in the Lower Rio Grande Valley of Texas and Mexico, F. F. BIBBY and I. MORENO. (U. S. D. A. coop. Tex. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 736-737).—The secondary hosts of the pink bollworm in the Lower Rio Grande Valley here noted are okra, which ranks second to cotton in importance: *Malvaviscus drummondii*, found in many places in the Lower Rio Grande Valley, in a portion of Florida, along the entire Gulf Coast between Florida and Texas, and along the Atlantic Coast between Florida and Pamlico Sound, N. C., which is occasionally infested; and *Pseudobutylon lozani*, a mallow found in nine counties of Texas and in Mexico, from which two pink bollworm moths emerged.

The relation of moisture content of the cotton plant to oviposition by *Heliothis armigera* (Hbn.) and to survival of young larvae, R. K. FLETCHER, (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 856-858).—An examination of the data obtained during the years 1935, 1936, and 1937 and again in 1938 and 1939 has shown that the correlation between the average percentage of moisture in the entire cotton plant and number of eggs per 100 plants was not significant. The correlation between oviposition and the percentage of water occurring in the growing tips only was found to be not significant in 1938 but was significant in 1939. In 1939 there was found to be a highly significant correlation between the number of larvae at each point and the percentage of moisture in the growing tips based on the weight of water in the entire plant. This highly significant correlation occurs even though it has often been found that a high percentage of the first-instar larvae is destroyed by predators.

Guerra al gusano rosado de algodón, G. N. WOLCOTT (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 5, pp. [7-8], figs. 4).—A practical account of the fight against the pink bollworm.

Preliminary report on Iowa mosquitoes, J. A. ROWE. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 211-225).—This report includes records of distribution and seasonal occurrence, notes on larval habitats, and larval associations. Thirty-five species, representing the genera *Anopheles*, *Uranotaenia*, *Theobaldia*, *Mansonia*, *Psorophora*, *Aedes*, and *Culex*, are recognized as occurring in the State.

Notes on disease-carrying mosquitoes of North Dakota, H. S. TELFORD and C. WESTER (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 2, p. 13).—This records the discovery of *Anopheles maculipennis* and *A. punctipennis* in eastern North Dakota during the fall of 1941.

Observations on mosquito transmission of *Plasmodium lophurae*, R. L. LAIRD (*Amer. Jour. Hyg.*, 34 (1941), No. 3, Sect. C, pp. 163-167).—Three mos-

quitoes, *Culex restuans*, *Aedes atropalpus*, and *A. albopictus*, were found to be susceptible to *P. lophurae*. Attempt to infect the yellow-fever mosquito and the northern house mosquito failed. Transmission of *P. lophurae* through *A. albopictus* was demonstrated. The presence of apparently mature sporozoites in the salivary glands of the mosquito host does not always indicate ability to infect a susceptible animal. Ducks recovered from an infection of *P. lophurae* were shown to have an immunity to superinfection with the same parasite.

The fruitflies of the genus *Anastrepha*, A. STONE (*U. S. Dept. Agr., Misc. Pub.* 439 (1942), pp. 112, pls. 23, figs. 22).—This publication discusses the economic importance, food plants, geographical distribution, and specific characters and terminology of members of the genus *Anastrepha*. A key is included for separation of the females. Besides the 104 old names, 52 new ones are proposed. The species incorrectly placed in the genus are mentioned, and those considered valid are described. Both photographs and figures are used to illustrate characters of different species. Ten references are cited, and an index to the various species is included.

Total carbohydrate and glycogen content of the developing honeybee, R. M. MELAMPY and R. D. OLSAN. (*U. S. D. A. and La. State Univ.*) (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 754-758).—An investigation of the changes in the concentration of the total carbohydrate, glycogen, and free reducing sugar which occur in the development of the worker honeybee has shown that during the larval period there is a marked increase in the total carbohydrate and glycogen. During the pupal period both the total carbohydrate and glycogen decrease. At the time of emergence a very small amount of carbohydrate reserve remains. In addition to glycogen, there is in the tissues of the immature honeybee a reserve carbohydrate which is convertible, by acid hydrolysis, to reducing sugar. Free reducing sugar is found in the tissues of larval and pupal honeybees.

A revision of the chalcid-flies of the genus *Monodontomerus* in the United States National Museum, A. B. GAHAN (*U. S. Natl. Mus. Proc.*, 90 (1941), No. 3116, pp. 461-482).—Fifteen species of chalcid flies of the genus *Monodontomerus* at hand are described and hosts and their known occurrence recorded. Nine are new to science, of which seven are from the United States and two from Mexico.

Relapsing fever: *Ornithodoros parkeri* a vector in California, G. E. DAVIS, H. L. WYNNS, and M. D. BECK (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 51, pp. 2426-2428).—The first case of relapsing fever transmitted by the tick *O. parkeri* is recorded from Stanislaus County, Calif.

The citrus bud mite *Eriophyes sheldoni* Ewing, A. M. BOYCE and R. B. KORSMEIER. (*Calif. Citrus Expt. Sta.*). (*Jour. Econ. Ent.*, 34 (1941), No. 6, pp. 745-756, figs. 9).—This contribution (*E. S. R.*, 79, p. 663) reports upon the life history and habits, economic importance, and means of control of *E. sheldoni*, which was first recognized on lemon trees in Ventura County, Calif., in 1937 and has become a serious pest of lemons in that State. This mite has been found in five counties in the southern portion of California and is also recorded from Queensland and New South Wales in Australia and from the island of Oahu, Hawaii. *Citrus* species are the only known hosts. Nursery stock is probably the best medium for disseminating the mite into uninfected areas. In California the lemon is the only host in fruiting that is seriously affected. Approximately 25,000 acres of lemons are infested although the injury is only important on about 20,000 acres, most of which are in the coastal and intermediate areas. Owing to the very small size of this mite, the quantitative evaluation of the effectiveness of treatments for control is difficult. Fumigation

with HCN and also with vaporized nicotine under tented trees was not satisfactory. The regular petroleum oil that is used on citrus and sulfur or sulfur-containing materials applied as sprays have shown the greatest effectiveness of the various materials tested.

The chigger and its control in Missouri, P. C. STONE and L. HASEMAN (*Missouri Sta. Cir.*, 214 (1941), pp. [4], figs. 2).—A practical account.

ANIMAL PRODUCTION

[Experiments in livestock production by the Bureau of Animal Industry]. (Partly coop. expt. stas. et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1941, pp. 4-5, 12-13, 14-17, 18, 21, 22-25, 27-28, 28-29, 30-31, 33-35, 40-43).—Progress is presented on investigations of type in swine and amount and quality of feed and effect of sex on pork and beef production; tenderness of beef heated before freezing and storage; feed, mineral, and vitamin requirements for beef production; rat tests of the nutritive values of redbud, Kentucky bluegrass, and orchard grass; nutritive values of fats and oils for rats; feeds for quail; indexes for meat carcass quality; index of juiciness of meat; standards for grading and composition of pork and lamb carcasses and fat distribution on different rations; method of determination of salt and moisture in cured ham; mineral and vitamin A needs of beef cows; crested wheatgrass and western wheatgrass and lespedeza as sources of hay and pasture for yearling cattle; sweetpotato meal v. shelled corn; relation of efficiency of feed utilization to grade of steers; comparison of ryegrass pasture v. corn silage as roughage for steers; finishing yearling steers on lespedeza with and without white shelled corn; effect of intensity of grazing by beef cows and steers on range vegetation; calf production and gains in steers; fertilization and management of pastures and cottonseed cake for steers; relation of milking ability of ewes to lamb and mutton production; methods of measuring fiber fineness and variability and density of fiber in wool; comparisons of different rations for feeding sheep on pasture, range, and hay; relation of diet to milk production and fleshing in milk goats; feeding soybean meal and peanut meal in comparison with trinity mixture as supplements to corn for swine; nerve degeneration and incoordination in swine prevented by liver extract and vitamin B complex; electric hovers for pigs; feeding and measurements of production by horses; the prevention of poultry troubles (toe picking and cannibalism) by corrected nutrition; causes of gizzard erosion; absorption of fats; antirachitogenic nature of cereals for poultry; relation of wheat-germ oil and thyroid to semen production; fattening of turkeys; water consumption by poultry; and accomplishments of the National Poultry Improvement Plan during the first 6 yr.

[Animal production studies by the Alabama Station] (*Alabama Sta. Rpt.* 1940, pp. 27-29).—Studies are reported by W. D. Salmon, D. F. King, and G. J. Cottier on oat pasture as a protein supplement and basic slag as a mineral supplement for hogs, management of farm poultry flocks, the value of kudzu and other forms of summer green feed for poultry, and a comparison of kudzu meal and *Lespedeza sericea* leaf meal as vitamin supplements to the chick and laying rations.

[Investigations in livestock production by the Colorado Station] (*Colorado Sta. Rpt.* 1941, pp. 20-21, 22, 35, 38-40).—Results are briefly reported on studies of mineral composition of alfalfa hay, mineralized drinking waters for livestock, Middle Park hay and North Park hay for cattle, satisfactory use of iodine supplementation for ewes, iodine requirements of poultry, green feed for chickens and turkeys, and vitamin D and reproduction in turkeys.

Records of performance for meat animals, L. M. WINTERS. (*Minn. Expt. Sta.*). (*Empire Jour. Expt. Agr.*, 8 (1940), No. 32, pp. 259-268).—The essential

factors to be considered in establishing records of performance for beef cattle, sheep, and swine are discussed. The desirability of individual feeding for knowing how efficiently meat is produced is of special interest.

pH values of the contents of the gastro-intestinal tracts of some farm animals, O. E. OLSON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 20 (1940), pp. 34-41).—The four stomachs of slaughtered sheep and cattle were similar in pH, while the pH of the hog's stomach was similar to that of the abomasum of sheep and cattle. The intestinal contents of the hogs and sheep ranged from neutral to slightly acid.

The influence of plane of nutrition and of environmental temperature on the relationship between basal metabolism and endogenous nitrogen metabolism subsequently determined, R. TREICHLER and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 22 (1941), No. 4, pp. 333-343).—In studies of the effects of differences of plane of nutrition and environmental temperatures on the metabolism of rats it was found that the basal metabolic rate and the higher plane of nutrition, which permitted a slow gain at 28° C., was 8.3 percent higher than for rats on a maintenance ration. The endogenous nitrogen output in the urine per square meter of body surface averaged about 4 percent less on the higher plane of nutrition. The ratio of endogenous nitrogen to basal calories was considerably and significantly depressed by the higher caloric intake. In a second experiment in which the effects of temperatures of 4° and 28° were compared, as well as the excess and maintenance rations, it was found that the basal metabolic rate was significantly increased by prior exposure to the lower environmental temperature, as well as the effects of increased food. However, there were no significant differences in the basal metabolic rate at 4° and 28° if food intake was similar.

Body size and metabolism of liver slices in vitro, M. KLEIBER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 419-423, fig. 1).—The metabolic rate per unit of live weight in vitro of liver slices from rats, rabbits, sheep, one horse, and one cow was inversely proportional to the fourth root of body weight. Thus the metabolic rate of the intact animal and the factors which determine the metabolic level in vivo seem still to be present in surviving tissues from the organism, as noted previously (E. S. R., 66, p. 856). The oxygen consumption of liver slices cut from the living animal was measured in a respiration apparatus within from 15 to 30 min. after death.

Metabolism trials with New Zealand feeding-stuffs, I, II, A. F. R. ADAMS and H. E. GARRETT (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), Nos. 3A, pp. 146A-151A; 4A, pp. 221A-228A).—Two trials are presented.

I. Rye-grass straw.—In starch equivalents, ryegrass straw was found in feeding trials with three wethers to average 32.5 on a wet basis, which was intermediate between very poor and good hay. Mineral balances were positive for magnesium, potassium, and sodium but negative for chloride, phosphate, and lime on the submaintenance rations.

II. Rape.—On low and high intake levels with three wethers the starch values of rape were determined as 79 and 77, respectively, on a dry basis. Mineral balances showed rape to be high in calcium and satisfactory in phosphate and magnesium.

New developments in making and feeding grass silage, M. H. BERRY. (Md. Expt. Sta.). (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 187-203).—A review is given of the molasses, phosphoric acid, A. I. V., and partial drying methods of making grass silage and of its nutritive value.

The cystine and methionine in certain species of grassland herbage, A. M. SMITH and T. WANG (*Biochem. Jour.*, 35 (1941), No. 3, pp. 404-412).—Samples

of white clover, orchardgrass (cocksfoot), perennial ryegrass, and timothy cut at different stages of growth and taken from different locations did not reveal significant differences in their contents of cystine and methionine, all being approximately 1.3 percent. Neither site nor manuring, with the exception of late nitrogen dressing, seemed to influence the results. The amounts of cystine and methionine rose to maxima when the plants reached or passed the heading stage, with smaller amounts thereafter.

The pantothenic acid content of royal jelly, P. B. PEARSON and C. J. BURGIN. (Tex. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 415-417).—Royal jelly was richer than any other known source of pantothenic acid. Assays of several samples showed royal jelly to contain an average of 183 μ g. of pantothenic acid per gram on a fresh basis and 511 μ g. on a dry-matter basis, which is from 2.5 to 6 times as much as is found in yeast or liver.

The minimum requirement of rabbits for dl- α -tocopherol, S. H. EPPSTEIN and S. MORGULIS. (Univ. Nebr.). (*Jour. Nutr.*, 22 (1941), No. 4, pp. 415-424, figs. 2).—Comparisons of the effects of different doses of α -tocopherol in the treatment and prevention of muscular dystrophy in rabbits indicated that the minimum requirement was probably about 0.32 mg. per kilogram of body weight per day. There was a direct relation between the total amount of α -tocopherol fed and the time interval over which it cured and protected the animal when the amount was less than about 60 mg. Sex and age did not affect the vitamin E requirement.

Some practical aspects of present vitamin knowledge for the farmer, P. E. JOHNSON (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 2, pp. 14-18).—A review is given of the vitamins needed and their sources in livestock rations.

Inspection of commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir.* 266 (1941), pp. 58, fig. 1).—A summary is given of the analyses of feeds officially inspected during 1940 (E. S. R., 84, p. 228), together with information on the Indiana feeding stuffs law and feeds for specific purposes.

Commercial feeding stuffs, 1940-41, E. R. TOBEY (*Maine Sta. Off. Insp.* 180 (1941), pp. 62).—The guaranteed and found analyses of the 807 samples of feedstuffs officially examined in 1940-41 are classified according to types of feed (E. S. R., 84, p. 798).

Inspection of commercial feeding stuffs, 1941, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 333 (1941), pp. 56).—The usual report of the guaranteed and found analyses of 466 brands of feeds officially examined during the year ended June 1941 (E. S. R., 84, p. 656).

Utilization of home grown feeds in fattening steers in the trans-Pecos region, J. H. and J. M. JONES and J. J. BAYLES. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 604 (1941), pp. 51, figs. 21).—In 8 years' experiments, comparisons of rations containing moderately large amounts of concentrates with other rations containing large amounts of roughage for yearling Hereford steers showed that rations high in roughage may produce reasonably well-finished steers when fed for about 200 days. The rations fed included ground threshed milo, ground milo heads, cottonseed, cottonseed meal, ground hegari fodder, alfalfa hay, hegari silage, oystershell, and salt. High gains were secured without addition of milo before 112 or 140 days. Only small amounts of alfalfa hay proved advantageous in rations high in ground hegari fodder, and ground hegari fodder proved more desirable than alfalfa hay as the sole roughage in high-concentrate rations. Self-feeding proved an entirely satisfactory method for feeding rations high in ground hegari fodder. Amounts of cottonseed replacing one-third of the ground milo grain in full-fed concentrate rations supplemented with cottonseed meal or in rations high in roughage feeds improved gain and

finish. Cottonseed proved a more satisfactory supplement to milo and cottonseed meal than as a replacement for either. Better results were obtained with the three feeds than with any two. No benefit resulted from feeding oystershell when hegari fodder was the sole roughage.

Soybean and Korean lespedeza hays compared with alfalfa for wintering beef calves, E. W. McCOMAS, M. W. HAZEN, and J. E. COMFORT. (Coop. Univ. Mo.). (*U. S. Dept. Agr. Cir. 629 (1942)*, pp. 8).—Although the commercial grades of hay varied and the gains of cattle differed, soybean, lespedeza, and alfalfa hay gave satisfactory results for fattening calves with corn, cottonseed meal, and sorgo silage in two 1-yr. experiments of 140 days each. At the start of the first experiment the calves averaged 360 lb., but the animals used in the second year started at from 315 to 325 lb. In the first experiment the average daily gains were about 1.5 lb., but in the second test, which was conducted on a slightly higher nutritive plane, they reached about 2 lb.

Feeding value of rice by-products, M. G. SNELL (La. Expt. Sta.) (*Rice News*, 9 (1941), No. 1, p. 16).—In a 112-day finishing period with approximately 500-lb. steers, a mixture of rice polish and rice bran proved to have 82 percent of the feeding value of ground corn when fed with cottonseed meal and rice straw. Blackstrap molasses mixed with rice bran and rice polish had about 80-90 percent of the feeding value of corn. The average daily gain produced on the standard ration of 2.78 lb. was reduced to 2.3 to 2.5 lb. when the corn was replaced by the rice products alone or with the molasses.

Canadian Wiltshire bacon, XX-XXII (*Canad. Jour. Res.*, 19 (1941), Sect. D, Nos. 7, pp. 213-224, fig. 1; 8, pp. 225-232, fig. 1; pp. 233-239).—Three papers in continuation of this series (E. S. R., 86, p. 367) are as follows:

XX. *A comparison of certain chemical and physical properties of Canadian and Danish bacons, and their relation to flavour quality*, W. H. White, C. A. Winkler, and W. H. Cook.—A variance analysis of the physical and chemical properties of 9 samples of Wiltshire sides from each of 18 Canadian and 10 Danish factories showed that Canadian bacon generally contained more salt and was slightly drier and tougher than the Danish product. The greatest variation in the Canadian bacon was due to differences in factories, but differences between sides were the principal sources of variation in Danish bacon. Improvement in the flavor quality of Canadian Wiltshire bacon could be achieved by milder cures and improved handling and curing practices.

XXI. *Objective colour comparisons of Canadian and Danish bacons, and their relation to subjective observations of colour quality*, C. A. Winkler, G. Abel, and W. H. Cook.—Analyses of the color determinations of samples of Danish and Canadian bacon showed Danish bacon to be lighter in color than Canadian bacon in the smoked and unsmoked conditions, but the color was equally stable in bacon from both sources. Comparison of photoelectric determinations of the scatter in terms of specific colors with subjective estimates of color by the six members of the jury indicated colors of bacon of satisfactory quality.

XXII. *Comparative carcass quality of Canadian and Danish bacons*, C. A. Winkler, W. H. White, and G. Abel.—Study of samples of Canadian and Danish Wiltshire showed that, although the carcasses were essentially the same, the eye of lean of the Canadian bacon was slightly longer than, but approximately equal in width to, that of the Danish bacon. Canadian factories were definitely superior regarding the precaution to prevent scorching during singeing.

A check list of poultry bulletins (1931-1940), L. E. CARD. (Univ. Ill.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 58-69).—A compilation is given of the research

and technical bulletins relating to poultry and eggs which have been issued by the experiment stations from 1931 to 1940, inclusive.

Avoiding failure in the poultry business, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen*, 28 (1941), No. 6, pp. [4]).—Advice on poultry production as a business enterprise is presented.

Removing gizzard contents from living birds, E. S. McCONNELL (Univ. Ga.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 45-46, figs. 2).—Description is given of a method and apparatus which were successful for removing the gizzard contents from 90 percent of the living birds tested.

Satisfactory poultry rations for Maryland conditions, H. R. BIRD (Univ. Md.). (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 299-300).—Rations are recommended for starting, growing, and laying mashers.

Cafeteria feeding of Leghorn pullets, C. S. PLATT and V. DABAGO (*New Jersey Stas. Hints to Poultrymen*, 29 (1941), No. 1, pp. [4]).—The egg production rate of White Leghorn pullets fed free choice on corn, oats, and mash from 12 weeks of age through the first year of egg production was approximately 54 percent for 1939 and 1940. Mortality in the respective years was 20.8 and 16.8 percent.

The accumulation of protein in the oviduct of the fowl, R. M. CONRAD and H. M. SCOTT (Kans. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 81-85, fig. 1).—Oviducts removed from hens at various times in the egg production cycle showed that soluble protein accumulates in the magnum at the rate of 4.05 percent per hour of the amount found in the fully formed egg, even with a pause between clutches. Histological studies showed the stage of activity of the tubular glands underlying the epithelium to influence the depth of the ciliated and mucous-secreting cells lining the lumen of the duct. There was no evidence of a storage of mucin.

Utilization of urea nitrogen by growing chicks, C. M. BICE and L. A. DEAN (Hawaii Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 15-17).—Growth of chicks on rations in which urea replaced one-third, two-thirds, and all of the protein supplement up to 16 weeks of age showed that the chicks did not utilize the urea. Similar results were obtained when raw sugar as a source of readily soluble carbohydrate was included in the ration of two other lots. Growth up to 12 weeks on rations in which the meat scrap, fish meal, linseed meal, and soybean meal were replaced by urea was only slightly greater than on rations without urea in which these protein feeds were low.

"Leg-weakness" in laying hens on an ascorbic acid-free (vitamin C) diet, T. A. BELL, G. H. SATTERFIELD, and F. W. COOK (Univ. N. C.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 473-475).—Certain hens, under the demands of heavy egg production and on a diet deficient in vitamin C, developed avitaminosis C resulting in leg weakness, inanition, and a depression of egg production. The mash and grain of 15 Barred Plymouth Rock hens fed in batteries were devoid of vitamin C, but by injections of 100 mg. of ascorbic acid every second day symptoms of vitamin C deficiency and leg weakness were prevented. Three of the hens not receiving the C supplement developed leg weakness and stopped laying after 62, 67, and 68 days, respectively, on the diet. Dramatic recovery was produced and egg production was renewed by 10 daily injections of 1,000 mg. of ascorbic acid. The need for vitamin C by high-producing birds seems apparent.

Tryptophane requirement of the chick, H. J. ALMQUIST and E. MECCHI (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 526-528).—Additions of from 0.16 to 0.36 percent of *l*-tryptophan to a ration did not increase the growth rate as determined at frequent intervals for from 6 to 9 days. A

diet of 0.44 percent *l*-tryptophan seemed sufficient for a good rate of growth. In other experiments in which the casein was hydrolyzed the chicks lost weight, but when increased amounts of *l*-tryptophan were added the rate of gain increased. The optimum growth was attained with approximately 0.5 percent of *l*-tryptophan in the ration.

Relation of a growth factor required by *Lactobacillus casei* ϵ to the nutrition of the chick, B. L. HUTCHINGS, N. BOHONOS, D. M. HEGSTED, C. A. ELVEHJEM, and W. H. PETERSON. (Univ. Wis.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 681-682).—Additions of a concentrate of the factor required by *L. casei* ϵ (= *L. helveticus*) (E. S. R., 83, p. 460) to a complete ration for chicks were found to increase the weights the chicks attained at 4 weeks of age from an average of 106 gm. with no additional supplement to 192 gm. with the concentrate. A purified concentrate from this one produced chicks weighing only 124 gm. at 4 weeks. In storage, approximately the same amount of activity for both the bacterial and chick factors was lost. It appears that the chick and bacterial factors are identical.

Mineral partition during intestinal digestion of normal- and high-mineral rations by chicks, S. L. BANDEMER and P. J. SCHABLE. (Mich. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 3-7, fig. 1).—Oystershell and bonemeal remained undissolved in calcium and phosphorus solutions in vitro at acid reactions similar to those found in the small intestine, and, as a solid phase, calcium was removed partially, and phosphorus more completely, from solution. Changes in the contents of the first, second, and third portions of the intestine of baby chicks after 5 weeks' feeding in groups on a basal ration or with additions of 7 percent of oystershell or bonemeal showed that on the normal ration the insoluble calcium and phosphorus increased and water decreased as the intestine was traversed. With high-mineral rations the soluble calcium concentration was greater than normal in the first portion of the small intestine, but lower in the intestine the amount of soluble minerals decreased and the insoluble form increased. Neither calcium nor phosphorus per se seemed to be responsible for perosis, since bonemeal produced more perosis but did not alter the blood and bone composition; whereas oystershell caused high blood calcium, low blood phosphorus, and low bone ash.

Environmental temperature and infertility in White Leghorns, W. F. LAMOREUX. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 18-22).—Analysis by variance of the percentage of fertility of 7 different hatches totaling over 20,000 eggs laid by 593 White Leghorn hens mated with 71 δ s in uninsulated breeding pens from 1935 to 1940 showed that there were significant differences between years which could not be accounted for by temperature differences. As partial explanation of discordance with the results of Hays and Sanborn (E. S. R., 81, p. 636), it is pointed out that the data in this study were based on eggs laid by hens under artificial lighting and that most of the δ s were dubbed.

Hatching ability of poultry.—I, **Texture of egg shells in relation to loss of weight during incubation**, E. W. HENDERSON (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 118-122, pl. 1, fig. 1).—The percentage of moisture lost in eggs during incubation was associated with candling score, ranging from 10.47 to 12.91 for 2,300 eggs. There was no correlation of microscopic pores to candling texture.

Differences between high and low quality fresh eggs, R. M. CONRAD and H. M. SCOTT. (Kans. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 77-80).—From a study of the composition and chemical properties of the eggs of 24 hens laying the highest-quality and 26 hens laying the lowest-quality eggs from a flock of 450 Rhode Island Red and White Leghorn hens, the only factor that

showed a significant relation to quality was the sodium concentration in the white, although potassium was suggestive of significance. There was no significant relation of the quality of the fresh egg to calcium, magnesium, or mucin content of the white or histological structure of the oviduct of the hens laying these eggs. Evidently something other than these factors has a great influence in determining the quality of the freshly laid egg.

Fifty years of refrigeration in the egg and poultry industry, M. E. PENNINGTON (*Ice and Refrig.*, 101 (1941), No. 1, pp. 45-48).—A review is given of progress in preservation of poultry meat and eggs through refrigeration.

Feeding and confinement rearing experiment with turkeys during 1940, F. N. BARRETT, C. G. CARD, and A. BERRIDGE (*Mich. Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 101-110).—Continuing previous studies on management and feeding of turkeys (E. S. R., 84, p. 661), the authors found that the total amount of grain consumed per unit of gain and the proportion of grain to mash were consistently increased by free-choice feeding of corn and oats, as compared with feeding corn alone. When corn, wheat, oats, and barley were fed free-choice as the grain, oats continued to exceed the combined total consumption of the other grains. Corn was not heavily consumed until about the nineteenth week of age. A cobblestone yard proved very successful for rearing turkeys in confinement. The 1940 trials were conducted with 10 lots each having 30 standard or small-type Bronze turkeys or reciprocal crosses between them.

Biotin and prevention of dermatitis in turkey poults, H. PATRICK, R. V. BOUCHER, R. A. DUTCHER, and H. C. KNANDEL (Pa. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 456-458).—Dermatitis occurred by 4 weeks of age in a large number of the turkey poults on rations containing riboflavin, pantothenic acid, nicotinic acid, cane molasses, water- and alcohol-soluble fractions of dried beef liver, and dried brewers' yeast. However, residues from liver and yeast extraction rendered complete protection. These results suggested the presence of biotin, and it was found that a biotin concentrate free of other members of the B complex gave complete protection from dermatitis although growth was slow. Dermatitis occurred in 89 percent of the poults on the ration without biotin. When the basal ration was fed plus 5 percent of yeast residue and 0.0005 percent of riboflavin, rapid growth was attained.

New device simplifies breeder selection, W. E. POLEY. (S. Dak. State Col.). (*Turkey World*, 16 (1941), No. 9, pp. 12-13, 43-47, figs. 5).—A review is given of methods developed from measurements previously noted by Milby et al. (E. S. R., 81, p. 95) for selection of turkeys as breeders.

DAIRY FARMING—DAIRYING

A double change-over design for dairy cattle feeding experiments, W. G. COCHRAN, K. M. AUTREY, and C. Y. CANNON. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 11, pp. 937-951).—The design of a short-time switch-over trial, comparing 3 rations, and the procedure for the statistical analysis of the data are described. The principal feature of the design is the division of the experimental animals (18 in this case) into groups of 3 on the basis of expected yielding ability. The 3 sequences of feeding are then allotted at random to the 3 cows of each group. Thus each group of 3 cows constitutes an independent experiment of the 3 x 3 Latin-square type. The principal objects of the design are to secure accurate comparisons of the effect of the rations and unbiased estimates of the experimental errors. It is also possible by this method to estimate and adjust for carry-over effects, which usually have been ignored in switch-over trials. A corresponding design for 4 rations is briefly described.

Careful handling of beet tops will enhance value as additional roughage for dairy cows, H. C. DICKEY (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 4, pp. 12-13).—It is recommended that clean beet tops be ensiled either in silos or in stacks, but that dirty or muddy tops be dried in small piles in the field. The addition of 1 oz. of ground limestone to each 50 lb. of beet tops at the time of feeding improved their feeding value for dairy cows, probably because of the neutralization of the oxalic acid in the beet tops. The limited feeding of beet tops supplemented with hay and grain is preferred to unlimited feeding of the tops.

Straw pulp: Results of controlled feeding trials (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 48 (1941), No. 2, pp. 85-91).—This report presents the results of controlled feeding trials with cattle at five research centers in England and Wales to determine the nutritive value of chopped cereal straw (wheat and barley) treated with caustic soda. This treatment, commonly known as the "straw pulp process," consists of soaking the chopped straw in a 1.5-percent solution of caustic soda for 20 hr., draining, and then washing with water for about 4 hr. The results reported are somewhat variable. In trials at the National Institute for Research in Dairying and the Hertfordshire Institute of Agriculture with growing dairy heifers, the treated straw when fed as the supplement to a suitably balanced ration was significantly better than the untreated straw in promoting growth. A steer fattening trial at the Midland Agricultural College, in which treated and untreated straws were fed as supplements to a basic ration of hay, concentrate mixture, and minerals, showed an advantage of 0.7 lb. daily gain per head for the group receiving the straw pulp. On the other hand, steer fattening tests at Cambridge University and the Norfolk Agricultural Station showed no significant advantage of the treated straw over untreated straw as supplements to a fattening ration.

From minerals to vitamins: The story of a change in emphasis in cattle feeding, V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 95-98).—This is a brief résumé of research in this field at the station, with particular emphasis on the minimum carotene requirements of cattle, which are placed at about 50 mg. daily per 1,000 lb. live weight. The necessity of providing an ample supply of high-quality roughage to meet these requirements and to provide a substantial proportion of the total nutrient intake is stressed.

The vitamin A content of milk and storage tissues of dairy cows as related to pasture and feeding practices, C. J. KOEHN (*Alabama Sta. Rpt.* 1940, pp. 25-27).—Included are brief progress reports of studies on seasonal variation in the vitamin A content of milk, the effect of winter pasture on the vitamin A content of milk, and the carotene content of various dairy feeds.

Physiology of dairy cattle, II (*Jour. Dairy Res. [London]*, 12 (1941), No. 2, pp. 213-226).—Continuing this biennial review series (E. S. R., 81, p. 412), part 2, Nutrition, by E. C. Owen, gives a comprehensive review of recent developments within this field, with 153 references to the literature.

The relation between the fat and carbohydrate metabolism of lactation, as indicated by the respiratory quotient of the mammary gland, E. P. REINEKE, W. D. STONECIPHER, and C. W. TURNER. (Mo. Expt. Sta.). (*Amer. Jour. Physiol.*, 132 (1941), No. 2, pp. 535-541).—Respiratory quotients of the mammary gland of goats, calculated on the basis of the oxygen and carbon dioxide contents in simultaneously drawn arterial and mammary venous bloods, were found to be as follows: Lactating gland (blood samples drawn with no preliminary anesthesia) 1.17 ± 0.0361 , lactating gland (blood samples drawn with blood vessels anesthetized locally) 1.15 ± 0.034 , lactating gland (blood samples drawn while the animals were under mild nembital anesthesia) 1.09 ± 0.0115 , gland of

nonlactating pregnant goat 1.09, and gland of nonlactating, nonpregnant goat 0.81. When lactating goats were fasted the respiratory quotient of the mammary gland declined to below unity by the third day of fast. In view of the known declines in the lower fatty acids of milk fat during fasting, this parallel decline of the respiratory quotient with advance of fasting suggests that the synthesis of milk fat from carbohydrate is confined largely to the fatty acids of low molecular weight. The carbohydrate balance of the lactating mammary gland and its relationship to the possible synthesis of milk fat from carbohydrate is discussed (E. S. R., 86, p. 235).

Suggestive evidence for the existence of a new factor essential for lactation, B. SURE. (Univ. Ark.). (*Jour. Biol. Chem.*, 140 (1941), No. 1, p. CXXX).—A factor in addition to vitamins A, D, and K, thiamin, riboflavin, pyridoxin, calcium pantothenate, choline, and factor W was found necessary for lactating ♀ rats to rear their young. The missing substance was supplied by liver, rice bran, defatted wheat embryo, and brewers' yeast.

Comparison of assay methods using International Standard lactogen, J. MEITES, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 28 (1941), No. 5, pp. 707-709).—To induce a crop-gland response in 50 percent of 20 pigeons there were required 1, 1.25, and 0.00625 International Units of lactogen administered by the subcutaneous, intrapectoral, and intradermal (micro) method (E. S. R., 83, p. 328). Because of its sensitivity, the intradermal method was preferred for assaying blood, urine, and body tissues.

Effect of estrogens, gonadotropins, and growth hormone on mammary glands of hypophysectomized rats, R. P. REECE and S. L. LEONARD. (N. J. Expt. Stas.). (*Endocrinology*, 29 (1941), No. 3, pp. 297-305, figs. 14).—Oestrogen administered to castrated hypophysectomized, hypophysectomized ♂, and spayed hypophysectomized rats had no influence on mammary gland development. A negative influence was also noted from endogenous oestrogen produced by gonadotropic hormones. Growth hormone produced slight mammary growth, but the simultaneous administration of oestrogen stimulated growth of the duct system, perhaps by liberation of the mammogenic factor contained in the growth hormone.

Effect of thyroidectomy of young male goats upon certain AP hormones, E. P. REINEKE, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 3, pp. 306-312).—Assays showed the pituitaries of eight ♂ kids thyroidectomized at from 5 to 24 days of age to contain normal amounts of lactogenic and thyrotropic hormones when the animals were killed at approximately 4 mo. of age. The gonadotropic hormone was present in the thyroidectomized kids only in amounts little more than half that found in normal kids, and the testes were 34 percent smaller than normal. In thyroidectomized animals the sugar-elevating factor of the pituitaries was very low, and the liver size was 20 percent less than normal.

Relation of size of litter to AP lactogen content of nursing rabbits, J. MEITES, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 670-671).—The lactogen content of the anterior lobe of the pituitary was not related to the size of litter, as ascertained by the Reece-Turner method (E. S. R., 78, p. 323). There were no significant differences in the lactogen content of the pituitaries of 11 does permitted to nurse litters of from 5 to 11 young and 10 does whose litters were reduced to 2 at 5 days after birth.

Thyrotropic hormone content of rabbit pituitary during growth, A. J. BERGMAN and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 3, pp. 313-319, figs. 4).—The amounts of thyrotropic hormone in each pituitary

and per gram of fresh tissue in ♂ and ♀ rabbits were increased with size to live weights of 2,500 gm., but a decline occurred for larger weights. The fact that the hormone in the pituitaries of the two sexes of the rabbit was similar, in contrast to other animals, was noted. The method of assaying the pituitaries for the thyrotropic hormone was with chicks, as previously noted (E. S. R., 82, p. 172).

Assay of posterior pituitary factors which contract the lactating mammary gland, C. W. TURNER and W. D. COOPER. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 3, pp. 320-323).—Determination was made of the factor present in the posterior lobe of the pituitary which caused a definite contraction of the mammary gland of an unnursed lactating rabbit within 40 sec. following intravenous injection. Comparative assays were given on commercial pituitrin, pitocin, and pitressin.

Biological assay of the mammogenic lobule-alveolar growth factor of the anterior pituitary, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 3, pp. 324-329, figs. 4).—A unit of mammogenic lobule-alveolar growth factor was defined as the amount of pituitary material injected subcutaneously over a 10-day period which caused lobule-alveolar development in 50 ± 10 percent of 10 ovariectomized nulliparous mice. This result was tested by anterior pituitary material from cattle and progesterone. A mouse unit of mammary growth factor was supplied by 875 γ of progesterone injected with oestrone.

A study of breeding records of one large herd of dairy cattle, M. S. HOFSTAD (*Cornell Vet.*, 31 (1941), No. 4, pp. 379-381).—A study of breeding records covering 309 conceptions indicated that the post partum sexual rest period averaged 94.5 days and the average number of services per conception was 1.65. Cows bred before the sixtieth day following calving required a higher average number of services per conception, and the percentage of abortions and cases of metritis, dystocias, and retained placentas among this group was relatively high. It is concluded from these data that breeding before the sixtieth day following parturition should be discouraged and that the best interval of rest between calving and the first breeding is from 90 to 100 days.

[Abstracts of dissertations on dairy problems] (In *Cornell University Abstracts of Theses, 1940*. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 270-271, 352-357, 415-416, 422-426).—Abstracts of the following doctoral theses pertaining to dairy problems are given: The Chemical Changes Occurring in Phosphoric Acid Silage, by E. J. E. Pagé (pp. 270-271); A Study of *Lactobacillus casei* and Related Organisms, by F. J. Rudert (pp. 352-354); Gas Production and Biochemical Properties on *Proteus* Bacteria, by M. L. Speck (pp. 355-357); Yeast in Concentrate Mixtures for Dairy Calves, by K. E. Gardner (pp. 415-416); Comparison of Dried Beet Pulp Versus Freshly Chopped Mangel Beets for Milk and Fat Production, by L. K. H. Lu (pp. 422-423); and The Effect of the Time and Temperature of Pasteurization Upon Some of the Properties and Constituents of Milk, by R. F. Holland (pp. 424-426).

Vitamin A and C in cow's milk, with a note on the synthesis of vitamin C in bovines, S. N. RAY, KARAM CHAND, and K. GOVIND RAU (*Jour. Dairy Res.* [London], 12 (1941), No. 2, pp. 109-118).—In studies at the Imperial Veterinary Research Institute, India, the method of Olson et al (E. S. R., 81, p. 269) for carotene and vitamin A determination and the standard titration method for vitamin C determination were applied to the milk of representative cows. Average values obtained were carotene 71 ± 32.03 yellow units per 100 cc., vitamin A 115.6 ± 35.46 blue units per 100 cc., and ascorbic acid 1.94 ± 0.35 mg. per 100 cc.

Protecting milk from light was found to be highly effective in preserving its vitamin C content.

To test the ability of cattle to synthesize vitamin C, young calves were maintained for long periods on a vitamin C-free diet. No significant variations occurred in the vitamin C concentration in the blood of the experimental and control groups, indicating that the calves were able to synthesize sufficient vitamin C for normal growth and activity. Attempts to produce vitamin C in vitro by growing bacteria isolated from various parts of the alimentary tract were unsuccessful.

Studies on ass's milk: Composition, C. P. ANANTAKRISHNAN (*Jour. Dairy Res. [London], 12 (1941), No. 2, pp. 119-130*).—This report from the Indian Institute of Science, Bangalore, indicates that the total solids of samples of ass's milk ranged from 7.8 to 9.1, the solids-not-fat from 7.14 to 8.5, and the fat from 0.54 to 0.71 percent. The milk was characterized by low casein, low globulin, and high albumin content, with average respective values of 0.7, 0.07, and 0.62 percent. Other average values were lactose 6.1, chloride 0.037, calcium 0.081, and phosphorus 0.059 percent. The fat had a relatively high iodine value and low Reichert and Krischner values.

Stability of the fat emulsion of homogenized milk, F. J. DOAN, D. V. JOSEPHSON, and J. ADAMS. (Pa. Expt. Sta.). (*Milk Dealer, 31 (1941), No. 2, pp. 35, 54, 56, 58-61, figs. 2*).—A study of 25 commercial lots (quarts) of homogenized milk held at from 40° to 43° F. for 48 hr. gave evidence that the difference between the fat content of the upper 100 cc. and the remainder of the total content varied from 2.5 to 77.0 percent, with only 8 of the samples meeting the U. S. Public Health Service definition of homogenized milk that "the fat percentage of the top 100 cc. of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 5 percent of itself from the fat percentage of the remaining milk as determined after thorough mixing."

Test with five piston-type homogenizers and one each of a rotary- and a centrifugal-type homogenizer gave evidence that the piston-type machine must be operated at pressures above 3,000 lb. to produce consistently milk meeting the U. S. Public Health Service specification, while the rotary and centrifugal machines used could not process milk to meet this definition. However, the rotary homogenizer was more efficient than the piston-type machine in stabilizing the fat emulsion in milk when similar pressures were employed. The fat content of homogenized milk within a range of from 3.5 to 4.5 per cent had only a very small and inconsistent effect on the stability of the fat emulsion. A modification of the Babcock test for homogenized milk is described. A comparison of the U. S. Public Health Service Index and the Farrall Index of efficiency of homogenization (E. S. R., 85, p. 520) indicated that a percentage difference of 5 under the former corresponds to a Farrall Index of about 20. It is the opinion of the author that the Public Health Service definition of homogenized milk is unreasonably stringent.

The influence of the time and temperature of homogenization on certain properties of the milk, G. M. TROUT and M. V. SCHEID (*Michigan Sta. Quart. Bul., 24 (1941), No. 2, pp. 122-131, pls. 2, fig. 1*).—A survey of the sequence of processing in 23 milk plants revealed that 4 homogenized before pasteurization, 5 homogenized after pasteurization with clarification, and 14 homogenized after pasteurization without clarification. Pasteurization temperatures ranged from 142° F. for 30 min. to 160° for 20 min., while homogenization pressures ranged between 2,000 and 3,000 lb. In experiments on the effect of homogenizing at various temperatures, raw milk previously held 24 hr. at 40° gave evidence that

at 5,000 lb. pressure complete dispersion of the fat did not occur at temperatures of 40°, 60°, or 80°, whereas dispersion was complete at 100°, 120°, or 140°. Marked acidity increases occurred when homogenization was carried out from 80° to 120°, but only slight increases occurred at 60° or 140° and none at 40°. Rehomonization of raw milk five times at 40° at 5,000 lb. pressure failed to disperse the fat, increase acidity, or alter flavor, even after 96 hours' storage. Pasteurization of milk homogenized raw at 100° prevented the development of rancidity but did not reduce the increase in acidity. It is stressed that when milk is homogenized before pasteurization facilities must be available for preheating milk to a desirable temperature for homogenization and for immediate subsequent heating to inactivate lipase, or preheating to a temperature which has practically inactivated the enzyme at the time of homogenization.

Foaming of homogenized milk, G. M. TROUT and M. V. SCHEID (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 113-115).—Based on the percentage increase in volume resulting from whipping for 30 sec. one hour after pasteurizing and cooling, it was determined that raw milk homogenized at 100° F. and then pasteurized exhibited much less foaming than milk homogenized after pasteurization. Pasteurized milk homogenized at 143° foamed only slightly more than at 100°, the difference apparently having no commercial significance. It is the authors' opinion that foaming of homogenized milk may be overcome by correcting certain handling defects rather than by varying the temperature or sequence of homogenization.

Flavor development in dairy products by microorganisms, B. W. HAMMER. (Iowa State Col.). (*Inst. Food Technol. Proc.*, 1 (1940), pp. 279-287).—A general discussion covering cultured buttermilk, salted and unsalted butter, and various types of cheese. The role of various chemical compounds responsible for flavors in dairy products is also briefly discussed.

The lactate-fermenting anaerobic and facultative organisms in silage, V. F. MARTOS. (Univ. Wis.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 140-141).—Bacterial analyses of silage samples indicated that anaerobic, lactate-fermenting sporeformers may be present in large numbers up to 100,000 per gram during the fermentation process, but that they are reduced to very low numbers after a pH of about 4 is reached. However, facultative lactate-fermenting sporeformers belonging to the *Aerobacillus* group were consistently present in relatively large numbers even when the pH was as low as 4. The number of these organisms in the feces of cows receiving the silage was from 10 to 100 times higher than in the silage fed. The possibility of the aerobacilli present in silage becoming an important contaminant of milk for cheese making is suggested, since it was found that this group of organisms may inhibit acid production by *Streptococcus thermophilus* and *Lactobacillus bulgaricus*.

Milk-borne diseases, J. SMITH (*Jour. Dairy Res.* [London], 12 (1941), No. 2, pp. 227-240).—This contribution to the biennial review series (E. S. R., 82, p. 383) covers the recent literature on the more prevalent types of milk-borne diseases, with 71 reference citations.

The relationship of methods of bacteriological examination to the eradication and control of mastitis (*Streptococcus agalactiae*), I, II, A. T. R. MATTICK, P. M. F. SHATTOCK, and M. MOREIRA JACOB (*Jour. Dairy Res.* [London], 12 (1941), No. 2, pp. 139-154).—The results of two studies are reported.

I. *The use of an enrichment technique in revealing streptococcal infections of the cow's udder* (pp. 142-151).—A comparison of several bacteriological techniques for revealing the presence of *S. agalactiae* in milk indicated that the use of sodium azide broth gave about the same results as the Edwards plating method. By use of an enrichment method consisting of the incubation for 24 hr.

at 37° C. of 9.5 cc. of milk mixed with 0.5 cc. of an alcohol-water solution of bromo cresol purple (final concentration 0.025 percent), followed by heavy streaking on Edwards' esculin crystal violet blood agar plates, it was possible to show many cases of infection with small numbers of *S. agalactiae* which gave negative results by other methods. It was also shown that the frequency of examination may have an important bearing on the number of positive cases discovered. On the basis of six herd histories recorded, it was evident that light infections may persist for long periods. Light udder infections with *S. dysgalactiae* or *S. uberis* and also mixed infections of *S. agalactiae* and *S. dysgalactiae* were frequently revealed.

II. *Streptococcus agalactiae* infections in heifers (pp. 151-154).—Applications of the Edwards test on 377 heifers showed that 4.5 percent harbored *S. agalactiae* in their udders from 10 to 20 days before calving and while isolated from the milking herd. About 21 percent gave positive mastitis reactions during their first lactation period. The bearing of these findings on the theory of contagion in *S. agalactiae* infections is discussed.

The use of chlorine in the near-sterilisation of milking machines, P. J. SKERMAN (*Jour. Austral. Inst. Agr. Sci.*, 7 (1941), No. 3, pp. 111-116).—Data are presented on the bacterial contamination of milking machines cleaned by a control method of cold-water rinse, hot-detergent rinse, boiling-water rinse immediately after milking as compared with that in machines where a chlorine solution either replaced the boiling-water rinse in the control method or was used as a supplementary rinse immediately before milking. Chlorine solutions when used at concentrations above 50 p. p. m. of available chlorine were much more effective than the control method in reducing bacterial counts on the various machine parts, particularly when the rinse was used immediately before milking. Calcium hypochlorite proved to be the cheapest source of chlorine and is recommended by the author. Chloramine preparations proved somewhat more stable than either the calcium or sodium hypochlorite, while the last-named was most easily used but was by far the most expensive.

A comparison of Dowicide A and chlorine (Diversol) for use in milking machines, F. W. FABIAN and G. L. NIELSEN. (Mich. Expt. Sta.). (*Jour. Milk Technol.*, 4 (1941), No. 5, pp. 268-275).—In tests extending over 1 yr., rinse solutions of sodium orthophenyl-phenate (Dowicide A) at concentrations ranging from 1:200 to 1:500 and solutions containing from 102 to 188 p. p. m. of chlorine were effective in reducing the bacterial contamination of milking machines, as indicated by the markedly lower bacterial plate counts of the rinse water and milk from treated machines as compared with similar values for control machines receiving no germicidal treatment. A solution of 1:200 Dowicide A was similar in germicidal potency to the above chlorine solutions. The former was much more stable, being usable for a week or more without significant deterioration. The use of the phenol compound in the milking machine rinse did not affect the phosphatase test of milk samples taken from the treated machine.

The keeping quality of milk powders.—I, Addition of antioxidants, R. WAITE (*Jour. Dairy Res.* [London], 12 (1941), No. 2, pp. 178-183).—Tests were conducted at the Hannah Dairy Research Institute in which 0.1, 0.25, and 0.5 percent of oat flour was added to milk both before and after condensing and also directly to spray-dried milk powder. When used at the lowest concentration the oat flour exerted little antioxidative effect on the butterfat in the milk powder, but 0.25 percent added to the milk, preferably before condensing, increased the resistance of the resultant powder to the development of tallowness by the equivalent of about 4 mo. at normal temperatures. The highest concen-

tration gave still greater protection against oxidized flavor but imparted a noticeable oat flavor to the milk powder. Hydroquinone, when added to the milk either before or after condensing at a concentration equivalent to 0.5 percent of the weight of butterfat, was highly effective in preventing oxidized flavor development in the milk powder. However, it imparted an objectionable metallic flavor to the powder and reconstituted milk.

The effect of acidified cans on the quality of dairy products and on the phosphatase value of cream and butter, A. L. RIPPEN and L. H. BURGWARD. (Ohio State Univ.). (*Milk Plant Mo.*, 30 (1941), No. 11, pp. 55-56, 58, 59).—Milk cans were acidified with a gluconic acid rinse applied by attaching an acid ejector on the last steam jet of the can washer. Acidifying cans to a pH below 6.0 resulted in retardation of the rate of growth of proteolytic bacteria and a fresher odor in the cans when they were wet and allowed to stand for 24 hr. or longer as compared with unacidified cans similarly treated. Considerable bacterial growth occurred in wet cans, however, regardless of the pH, which emphasizes the need of thoroughly drying cans to prevent bacterial growth. No significant difference was noted in the flavor score and bacterial count in raw or pasteurized milk or in the quality of raw cream held in acidified v. nonacidified cans. Butter was churned from various lots of cream held in acidified and unacidified cans. In many cases samples which gave negative phosphatase reactions when fresh became positive during storage, this change being accelerated as storage temperatures increased. These increases in phosphatase value occurred irrespective of the can reaction in which the raw cream was received at the plant.

A preliminary study of the effects of varying pitching consistency and rate of scald on the physical and chemical properties of Cheddar cheese and on the firmness of the cheese as judged by cheese-makers, bakers, and others, G. W. SCOTT BLAIR, F. M. V. COPPEN, and D. V. DEARDEN (*Jour. Dairy Res.* [London], 12 (1941), No. 2, pp. 170-177).—Continuing this line of investigation (E. S. R., 85, p. 813), six experimental Cheddar cheeses were made from the same batch of milk and under conditions as similar as possible, except that the consistency of the curd at pitching time—as determined by the Scott Blair method (E. S. R., 84, p. 522)—and, in two cases, the rate of scald were varied. Data are presented on chemical and physical analyses and the judgments of firmness as expressed by cheese makers, bakers, and nonexperts. The results indicate that the consistency of the curd at pitching time and probably the rate of scald are prime factors in determining the firmness of cheese.

Volatile acids of cheese, I-III (*Jour. Dairy Res.* [London], 9 (1938), No. 2, pp. 215-226, figs. 3; pp. 227-232; 12 (1941), No. 2, pp. 155-169, figs. 2).—Three reports are noted.

I. Retentive power of cheese and its constituents, E. R. HISCOX and J. HARRISON.—Experiments on direct steam distillation of cheese for the recovery of volatile acids indicated that true values are not obtained in this manner. The fat portion of the cheese exerted a retarding effect on the distillation of the higher volatile fatty acids, while the cheese protein proved capable of permanently retaining a part of some of the acids present. It appeared that the steam distillation carried to the point where twice the original volume was collected gave a more accurate picture of the distribution of the acids present in the cheese than could be obtained by distilling to five times the original volume. Distillation apparatus is described.

II. Methods of extraction, E. R. HISCOX, J. HARRISON, and J. Z. WOLF.—The experiments reported gave evidence that by water extraction of the cheese and alkaline extraction of the fat, followed by ether extraction of the residues, a

value for volatile acids was obtained which was about $4\frac{1}{2}$ times as high as that from direct steam distillation in the case of Stilton cheese and about twice as high in the case of Cheddars.

III. *Application of the extraction method*, E. R. Hiscox, J. Harrison, and J. Z. Wolf.—Based on extensive experience with this method, more detailed procedures for the extraction method are presented. A rapid method for the separation of the volatile fatty acids in cheese distillate, based on the relative solubility of the fatty acids in purified butterfat, is also described. Data are presented on the nitrogen distribution and the volatile acids in over 40 cheeses of the white- and blue-veined varieties. On the basis of the distribution of volatile acids, pH, and nitrogen break-down, distinctions could be drawn not only between the white- and the blue-veined varieties but also between Roquefort and Stilton groups of the latter varieties. A high total quantity and a characteristic distribution of the volatile acids appeared to be related to the heavy pricking of cheese of the Roquefort group.

VETERINARY MEDICINE

[*Work in animal pathology and parasitology by the Bureau of Animal Industry*] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1941, pp. 2-4, 7-11, 13, 21-22, 23, 35, 43-92*).—The work of the year reported (E. S. R., 84, p. 813) relates to Bang's disease; tuberculosis; phenothiazine as an anthelmintic; coccidiosis of lambs; bovine mastitis; fowl leucosis; avian encephalomyelitis, urinary calculi in calves (coop. Tex. Expt. Sta.); incidence of bloat in steer calves (coop. Mont. Sta.); nicotinic acid deficiency in silver foxes and minks (coop. Cornell Univ. et al.); vaccination of pigs with anti-swine-erysipelas serum; eradication of scabies and of dourine; inspection and quarantine of imported animals and products; pullorum disease antigens; tuberculin and other diagnostic tests; disinfectants; infectious equine encephalomyelitis; periodic ophthalmia; swine erysipelas; anaplasmosis; infectious anemia; miscellaneous diseases; stock-poisoning plants; toxicological investigations; tick eradication; hog cholera and its control; virus-serum control; and parasites of horses, ruminants, swine, poultry, and other animals and treatment for their removal.

[*Work in animal pathology and parasitology by the Colorado Station*] (*Colorado Sta. Rpt. 1941, pp. 20, 33-35, 36-37*).—The work of the year reported (E. S. R., 84, p. 668) relates to urinary calculi in feeder lambs, overeating (enterotoxemia) in feed lot lambs, feed lot gains of lambs as affected by drenching, control of coccidiosis in lambs through management, listerellosis and fringed tapeworms in lambs, Bang's disease, and the effects of iron salts on perosis.

[*Studies in comparative pathology, etc., in Japan*] (*Jap. Jour. Vet. Sci., 3 (1941), Nos. 1, pp. 1-88, pls. 6; 2, pp. 109-222, pls. 11, figs. 4; 3, pp. 241-347, pls. 4, figs. 29*).—Included in the contributions presented in No. 1 (E. S. R., 85, p. 528) are the following: Studies on Contagious Pleuro-pneumonia in Cattle—XII, Experimental Infection With Culture of *Asterococcus mycoides*, by S. Yamagiwa, S. Ito, and M. Niwa (pp. 1-22, Eng. abs. pp. 20-22) (E. S. R., 69, p. 421); Ein Fall von Pseudotuberkulose bei Schafen [A Case of Pseudotuberculosis in Sheep], by M. Watanabe (pp. 23-31, Ger. abs. pp. 30-31); Beobachtungen von *Sarcoptes*-Räude bei Trampeltieren, I [Observations of *Sarcoptes* Mange in Camels], by Y. Ono and S. Ikeda (pp. 33-42, Ger. abs. pp. 41-42); Der *Dermacentor reticulatus* (Fabricius) Koch, 1844, eine Zeckenart der Kamele aus der Hailar-Gegend in Nordwest Mandschukuo [*Dermacentor reticulatus* (F.) as a Camel Tick in the Hailar Region of Northwest Manchoukuo]

by Y. Ono (pp. 43-48, Ger. abs. p. 48); Studies on Equine Hemolytic Streptococci, Especially on Their Variability, by Y. Ochi and R. Hirao (pp. 49-70, Eng. abs. pp. 69-70); and On the Type Differentiation of Hemolytic Streptococci Isolated From Strangles, Pneumonia, and the Other Streptococcal Diseases of Equines—II, The Type Differentiation by the Serological Examination, by Y. Tuji and A. Sato (pp. 71-88, Eng. abs. pp. 86-88) (E. S. R., 85, p. 529).

Contributions in No. 2 include: Studies on Contagious Pleuro-pneumonia in Cattle—XIII, Histological Investigations on the Experimental Lung-Plague Pneumonia, by S. Yamagiwa (pp. 109-133, Eng. abs. pp. 131-133) (see above); Studies on the Abortion Salmonellosis Among Horses—II, Experimental Cases of the Abortion Salmonellosis, by K. Fukano (pp. 135-153, Eng. abs. pp. 152-153) (E. S. R., 85, p. 529); On the Experimental Haemonchosis of Sheep, by S. Nagahata, J. Fujita, and S. Ikegaya (pp. 155-190, Eng. abs. pp. 189-190); On the Diagnostic Value of the "Stamp-Smear Method" in the Case of Cervicitis of Pregnant Mares, by Y. Kawahara (pp. 191-203, Eng. abs. p. 203); and Über die toxische Substanz der Pathogenen Mikroorganismen—I, Die Beobachtung über das Toxin der *Salmonella pullorum* [The Toxic Substance of Pathogenic Micro-organisms—I, Observation of the Toxin of *Salmonella pullorum*], by J. Gotoh and T. Nakayama (pp. 205-222, Ger. abs. pp. 221-222).

Contributions in No. 3 include: Pharmacological Studies on Mallein—I, Action of Mallein on the Extirpated Heart and Its Nature, by Y. Wakamatu (pp. 241-262, Eng. abs. p. 262); On the Experimental Infection With Rinderpest Virus in the Rabbit—IV, Complement-Fixation Reaction, by J. Nakamura and Y. Goto (pp. 263-286, Eng. abs. pp. 283-286) (E. S. R., 85, p. 529); Studies on the Canine Leishmaniasis in Manchoukuo—I, The Occurrence of the Canine Leishmaniasis in Mukden, by S. Ito, J. Yamashita, and M. Niwa (pp. 287-297, Eng. abs. pp. 296-297); On the Modification of the Fixation of Bacterial Film for Staining, by E. Ryu (pp. 299-308, Eng. abs. p. 308); On the Susceptibility of Rabbit to Artificial Infection of the Glanders Bacilli—I, Bacteriological and Post-Mortem Observations, by M. Watanabe and N. Nakamura (pp. 309-336, Eng. abs. pp. 334-336); and On the Type Differentiation of Hemolytic Streptococci Isolated From Strangles, Pneumonia, and the Other Streptococcal Diseases of Equines—III, The Relation Between Type Differentiation and Virulence Towards Laboratory Animals, by S. Namikawa and A. Sato (pp. 337-347, Eng. abs. pp. 346-347) (see above).

The occurrence of pleuropneumonia-like microorganisms causing arthritis isolated from healthy white rats, H. BEEUWKES (*Natuurw. Tijdschr. Nederland. Indië*, 101 (1941), No. 11, pp. 323-324).—The presence of pleuropneumonia-like microorganisms with arthrotropic qualities in the nasopharynx of healthy white rats is probable. By injecting exudate originating from the paw of a rat infected with arthritis and by cultivation on serum agar it is possible to show the presence of *Streptobacillus moniliformis*.

Studies on the *Listerella* group.—I, Biochemical and hemolytic reactions, P. C. HARVEY and J. E. FABER. (Univ. Md.). (*Jour. Bact.*, 42 (1941), No. 5, pp. 677-687).—Report is made of a study undertaken to determine some characteristic reactions of representative strains of the *Listeria* group under a single set of test conditions. The study indicates that acid is produced from glucose, levulose, galactose, maltose, mannose, rhamnose, trehalose, dextrin, and salicin. Variable results may be obtained with lactose, glycerol, sucrose, arabinose, xylose, mannitol, sorbitol, and starch. Acid is not produced in dulcitol, inositol, raffinose, glycogen, and inulin.

"A possible division of strains on the basis of melezitose fermentation is reported, and a correlation between this and Paterson's agglutinative groups is

suggested. Indole and acetylmethylcarbinol are not produced; nitrates are not reduced. The methyl red test is positive. Beta hemolysis is stated to be characteristic for the genus with the exception of one strain."

Recovery of virus morphologically identical with psittacosis from thiamin-deficient pigeons, H. PINKERTON and R. L. SWANK (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 704-706).

A new Salmonella type, Salmonella illinois, P. R. EDWARDS and D. W. BRUNER. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 240-242).—Under the name *S. illinois*, description is given of a *Salmonella* type which is represented by seven cultures isolated from three outbreaks of animal disease, namely, of hogs in Illinois, Hungarian partridges in Michigan, and turkeys in Minnesota. The antigenic formula of the bacillus is (III) (XV) XXXIV :z₃₆—1, 5

Two new Salmonella types closely related to Salmonella muenchen, P. R. EDWARDS and D. W. BRUNER. (Ky. Expt. Sta.). (*Amer. Jour. Hyg.*, 34 (1941), No. 3, Sect. B, pp. 121-124).—Descriptions are given of two new species of *Salmonella*. The first, *S. oregon*, has the antigenic formula VI VIII : d—1, 2, 3 and is represented by six cultures from hogs and turkeys. The second, *S. manhattan*, has the antigenic formula VI VIII : d—1, 5 . . . and is represented by two cultures from chickens and turkeys. The specific phases of the two types are identical and, while closely related to the specific phase of *S. muenchen*, can be distinguished from the latter by agglutinin absorption tests.

Stability of a strain of Salmonella, W. L. KULP, R. YOUNG, and R. HOULIHAN. (Univ. Conn.). (*Jour. Bact.*, 42 (1941), No. 5, pp. 643-652).—Experimental attempts to change *S. schottmulleri* flagellar antigenic factors to those of *S. typhimurium* by animal passage are reported. The stability of a fixed type of *Salmonella* could not be appreciably disturbed.

Studies on staphylococcal toxins, J. M. WOODWARD and L. W. SLANETZ. (Univ. N. H.). (*Jour. Bact.*, 42 (1941), No. 6, pp. 817-818).

Effects of sulfanilamide and sulfapyridine upon experimental streptococcal infections, C. H. HUANG and R. H. P. SIA (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 109-112).

Some reactions of a pathogenic flagellate, Trichomonas foetus, to environmental changes in bacteria-free cultures, H. S. LYFORD (*Amer. Jour. Hyg.*, 33 (1941), No. 3, Sect. C, pp. 69-87, figs. 5).—Report is made of observations of *T. foetus* in the absence of all other living organisms under conditions which were controlled so far as temperature, food supply, and gaseous exchange were concerned. Some of the biological characteristics of this organism in vitro were determined.

Cultivation of Trypanosoma equiperdum in yolk-sac of developing chick embryo, E. ALTURE-WERBER (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 90-92).—Work is reported which has shown that *T. equiperdum* can be cultivated in the developing chick egg by inoculation of infected material into the yolk sac of the egg.

Studies of phenothiazine, X, F. DEEDS (U. S. D. A. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 632-634).—In continuation of this series of studies (E. S. R., 85, p. 820), further observations on oxidation of phenothiazine are reported.

Effect of sulfanilamide and sulfapyridine on antibody formation, M. M. MASON (*Vet. Med.*, 37 (1942), No. 1, pp. 30-32).—The experiment reported has shown that antibodies can be produced in fairly high titer while experimental animals are under full therapeutic doses of sulfapyridine or sulfanilamide.

Studies on sulfadiazine, I-III (*Bul. Johns Hopkins Hosp.*, 69 (1941), No. 4, pp. 297-326, figs. 4).—These studies are presented in three parts.

I. *The chemotherapy of experimental haemolytic streptococcal, pneumococcal, and staphylococcal infections in mice*, P. H. Long, E. A. Bliss, and E. Ott (pp. 297-302).—The studies described have shown that one of the heterocyclic sulfonamide compounds (2-sulfanilamidopyrimidine), to which the name of sulfadiazine has been given, is an effective chemotherapeutic agent in the control of experimental hemolytic streptococcal, staphylococcal, and pneumococcal infections in mice. When equivalent blood concentrations of the drugs were compared sulfadiazine was found to be as effective as sulfanilamide in streptococcal infections and as sulfathiazole in staphylococcal infections, but less effective than sulfathiazole in pneumococcal infections. The inferiority of sulfadiazine to sulfathiazole in the last instance is offset by the greater ease with which relatively high blood concentrations can be produced and maintained with sulfadiazine. When blood levels of 25 mg. percent were obtained by increasing the proportion of the drug in the diet to 0.5 percent, sulfadiazine gave excellent therapeutic results. Moreover, mice tolerated these higher blood concentrations for periods of at least 2 weeks with no apparent ill effects, and showed no pathological alterations in spleen, liver, or kidney which could be attributed to the drug. It is pointed out that it is possible to produce and maintain relatively high blood concentrations of sulfadiazine without injury to the tissues, and because such concentrations have a marked therapeutic efficiency the drug may prove to be very useful.

II. *The clinical use of sulfadiazine in the therapy of bacterial infections other than pneumonia*, G. I. Trevett, R. A. Nelson, and P. H. Long (pp. 303-313).—In the authors' studies sulfadiazine proved to be very satisfactory and effective in the treatment of hemolytic streptococcal infections. The relatively low incidence of toxic reactions encountered in the course of its use led to the conclusion that it is safe to maintain higher blood concentrations of this compound than has been the custom with other sulfonamides. Because it is well tolerated, it appears to be the best available drug for the treatment of chronic bacterial infections which require long continued therapy.

III. *The use of sulfadiazine in the treatment of pneumococcal pneumonia*, F. T. Billings, Jr., and W. B. Wood, Jr. (pp. 314-326).—In 75 cases of pneumococcal pneumonia in which sulfadiazine was employed as the only form of specific therapy all but one recovered.

A list of references accompanies each of the three contributions.

Absorption and excretion of sulfadiazine, N. PLUMMER and H. K. ENSWORTH. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 734-738, fig. 1).—In the work reported sulfadiazine was found to be rapidly absorbed into the blood stream, and comparatively high levels of total drug were reached. The proportion of conjugated sulfadiazine in the blood was small. The blood level falls rather slowly after the drug is discontinued. Most of the drug is excreted by the kidney. In four patients given 2 gm. of sulfadiazine and in eight patients given a total of from 7 to 16 gm. the only toxic reaction noted was a morbilliform rash in one case in the latter group.

Vitamin A deficiencies in ruminants, H. SCHMIDT. (Tex. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 373-389, figs. 9).

Terminal cerebrospinal fluid pressure values in vitamin A deficiency, L. A. MOORE and J. F. SYKES. (Mich. Expt. Sta.). (*Amer. Jour. Physiol.*, 134 (1941), No. 2, pp. 436-439).—In continuation of the work noted (E. S. R., 85, p. 241) it has been shown that when young bovines are fed a vitamin A-deficient ration the cerebrospinal fluid pressures may attain values of 400 to 600

mm. of saline, or four to six times the normal value. These values were obtained with animals at the terminal stage of vitamin A deficiency. In two cases there was a terminal drop in pressure from a previously higher level. Usually the animals in this condition had very little appetite, showed diarrhea, and were more or less in a moribund state so that the drop was not surprising. The increase in cerebrospinal fluid pressure was always accompanied by a marked papilledema, incoordination, and periods of syncope. The condition of syncope often preceded to a state of convulsive seizure during which respiration ceased for short periods of time. It was felt that the syncope and convulsivelike seizures were due to a cerebral anemia because of the increased cerebrospinal fluid pressure. The fact that excitement often caused these seizures further indicates that this may be true, since it has been shown that a marked increase in pressure accompanies periods of disturbance. The particular cause of the increased cerebrospinal fluid pressure in vitamin A deficiency in the bovine has not been found. Pathological study of the choroidal plexus and arachnoid villi, colloidal osmotic pressure measurements of blood plasma, and various blood and urine analysis have not shown any abnormality which could be related to the raised pressure.

The effect of dissociation on the electrophoretic mobility of *Brucella*, T. W. STEARNS and M. H. ROEPKE. (Minn. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 6, pp. 745-755, figs. 2).—The authors find electrophoretic measurements under carefully controlled conditions on strains of *B. abortus* dissociated in broth to indicate that dissociation may be a gradual process. Dissociated forms (mucoid) having a greater mobility than the smooth appear after a few days in broth without the complete disappearance of organisms having the mobility values of smooth forms. Longer passage in broth causes further increases in mobility of dissociated forms and the gradual disappearance of organisms of mobility comparable to that of smooth strains. Dissociated forms having appreciably different mobility values may be separated by colony appearance when a given technic is used. The stability of these dissociated forms was not investigated. Passage of dissociated forms of *Brucella* of high mobility through guinea pigs causes a decrease in mobility value to that of the smooth forms without the loss of mucoid character. Serological tests show that mucoid organisms of low mobility are similar antigenically to mucoid forms of high mobility, but are appreciably different from the original smooth organisms. The complexity of the subject of dissociation is emphasized, and lines of further investigation are indicated.

A list of 21 references to the literature is included.

Calfhood vaccination seen as only an aid in eradicating Bang's disease from cattle, A. W. DEEM (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 4, pp. 3-4).—It is recommended that a combined program of vaccination and eradication be employed in the campaign against Bang's disease.

Testing cattle with johnin (*Jour. Hyg. [London]*, 41 (1941), No. 3, pp. 297-319).—This report on the value of the intradermal test on cattle was made by the British Agricultural Research Council's Committee on Johne's disease. The comparison between reactions to the double intradermal test with johnin and the post mortem showed (1) an agreement of 23 in 69 positive reactions or 19 in 52 if only those reactions are accepted concerning which there was no difference of opinion, (2) that out of 29 negative reactors 6 were found to have Johne's disease post mortem, i. e., in 23 was there agreement, or considering only the 17 which were unanimously called negative reactors 6 were positive and 11 negative post mortem, and (3) that if out of the 103 cattle tested only the 20 cases from which Johne's bacillus was isolated are considered, 10 reacted

positively to both johnins and 2 more to the heat-concentrated johnin, the only johnin used. Two gave doubtful reactions. The reasons for the large disagreement between clinical reaction and post-mortem results are to a great extent speculative.

Infection of adult cattle with *Mycobacterium tuberculosis avium*, R. E. GLOVER (*Jour. Hyg. [London]*, 41 (1941), No. 3, pp. 290-296).—A series of 35 unselected cattle tested with synthetic medium tuberculin and synthetic medium johnin was subjected to post-mortem examination. In 5 instances avian strains of full virulence for the usual experimental animals were recovered by the inoculation of guinea pigs with glandular suspensions or by cultural methods used for the isolation of John's bacillus. In 2 of these cases an avian type was isolated from the glands of the alimentary tract and a bovine type from the thoracic glands. In addition, there were 5 cases in which evidence of avian infection was not complete. From 1 a strain was obtained which was culturally identical with an avian type, but it was almost completely avirulent for laboratory animals. In 2, acidfast bacilli were seen in smears from the thoracic and mesenteric glands, respectively, and in the remaining 2, completely calcified glands were observed which were typically tuberculous but were devoid of acidfast bacilli (microscopical examination of smears and sections). Cultures from the organs of guinea pigs inoculated with glandular suspensions from the 4 last-mentioned cases failed to grow tubercle bacilli. In these circumstances the evidence that the infection was of the avian type is largely presumptive, but the nature and extent of the lesions suggests that such may have been the case. With regard to the tuberculin and johnin tests, clear-cut reactions to johnin were obtained in 7 instances, a doubtful reaction in 1, and negative reactions in 2. One-half of the animals were also positive to tuberculin.

Cultural and serological observations on *Vibrio fetus*, W. N. PLASTRIDGE (Univ. Conn.). (*Jour. Bact.*, 42 (1941), No. 6, pp. 816-817).—In the studies conducted four strains of *V. fetus* were isolated from aborted bovine fetuses from animals free from Bang's disease. "In the presence of an atmosphere containing 10 percent carbon dioxide moderate to heavy growth was obtained in a medium composed of liver infusion, 1 percent peptone, and 0.3 percent agar. Maximum growth resulted after 6 days' incubation at 37° C. and consisted of a heavy band from 4 to 5 mm. in width just beneath the surface. The optimum pH was between 7.0 and 7.4. The minimum depth of the medium required for good growth was from 2 to 3 cm. An agglutination antigen was prepared from 6-day-old cultures. The band of growth was removed with a pipette, diluted with 3 volumes of formalinized (0.3 percent) saline, and centrifuged at 1,600 r. p. m. for a period of 30 min. The cloudy supernatant fluid was removed and centrifuged in an angle centrifuge at 3,200 r. p. m. for 30 min. The sedimented cells were suspended in a small amount of formalinized saline. The suspension was diluted for use in the tube agglutination test to a density of 1.0 on the McFarland nephelometer scale. The blood serum of 5 cows which aborted fetuses from 3 to 7 mo. of age gave agglutinin titers of from 1 to 200 to 1 to 800, and 1 which aborted a 2-month-old fetus was negative to the test. These and other data obtained on 131 animals in four infected herds and on 221 animals in three herds regarded as free from *V. fetus* suggest that a titer of 1 to 200 or higher indicates infection, that a titer of 1 to 100 should be regarded as suspicious, and that a titer of 1 to 50 or lower is not significant."

Studies on bovine gastrointestinal parasites.—V, Immunity to the stomach worm, with a note on the prepatent period, R. L. MAYHEW. (La. Expt. Sta.). (*Amer. Jour. Hyg.*, 33 (1941), No. 3, Sect. D, pp. 103-111, figs. 3).—In continua-

tion of this work (E. S. R., 86, p. 388), description is given of inoculations with the stomach worm *Haemonchus contortus* which resulted in setting up a reaction similar to that developed against the nodular worm *Oesophagostomum radiatum* and the hookworm *Bunostomum phlebotomum* (E. S. R., 84, p. 394). In the experiments conducted, in which immunity developed to the stomach worm in six calves as judged by egg counts in eggs per gram of sediment, the immune reactions were initiated at the time adult worms were present and when the animals were reinoculated and immature larvae were present. That the sudden decreases in egg counts are associated with the initiation of the immune reaction and not due to a loss of worms from old age is suggested by the data on calves. That the immune reaction is not associated with degree of infection is indicated by the fact that the various animals had average egg counts preceding its initiation.

Some factors affecting the incidence of calf scours, W. T. S. THORP, J. F. SHIGLEY, and M. A. FARREL. (Pa. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 1, pp. 34-35).—Observations made over a 2.5-yr. period on cases of calf scours in a large dairy herd are reported. It was found that where the affection is a serious problem in a high producing herd, the regulation of the intake of the dam's milk tends to reduce the incidence and severity of the syndrome. A specific serum was necessary to check the severe outbreak encountered. After the scours had been brought under control the routine use of commercial serums at birth gave satisfactory results. The medicinal treatment of calves 2 to 3 days old was not highly successful where a large number of calves were affected. Medicinal treatment of calves over a week old has proved more satisfactory.

Calf scours, C. F. CLARK (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 99-100).—A popular discussion.

A note on the effect of repeated doses of phenothiazine on sheep, W. L. WRIGHT. (Univ. Ill.). (*Vet. Med.*, 37 (1942), No. 1, p. 33).—It was found that a single 25-gm. dose and six weekly 25-gm. doses of phenothiazine did not affect the blood hemoglobins and weight gains of yearling lambs and caused no pathologic constituents to appear in the urine.

Test of drenching feedlot lambs continued this year; last year's results described, G. S. HARSHFIELD and I. WATSON (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 4, pp. 10-12).—In order to determine (1) whether the drenching of lambs for removal of parasites is a profitable practice and (2) the efficiency of commonly used treatments, three groups each of 22 lambs were tested from November 25, 1940, to March 24, 1941. To the first group, phenothiazine ($\frac{1}{6}$ gm. per pound of body weight) was given; to the second group, a mixture of 1.5 percent copper sulfate and 0.4 percent nicotine sulfate at the rate of 1 cc. per pound of body weight was administered; and the third group was used as a check. A determination of the efficiency of the drugs in removing the parasites, made by counts of the worm eggs in the feces before and after treatment showed that in both treated lots there was a reduction in the numbers of parasite eggs to about one-third of the number being eliminated before treatment. Stated in percentage efficiency of the treatments against the Trichostrongylinae (roundworms) as a group, phenothiazine was 73.3 percent and copper sulfate-nicotine 87.8 percent efficient in removing all the worms. The phenothiazine-treated lambs showed 0.02 lb. increased daily gain, with 80 ct. per hundredweight decrease in cost of market gain, but 20 ct. per hundredweight decrease in market appraisal value (based on dressing percentage and finish) per lamb as compared with the untreated lot. The copper sulfate-nicotine-treated lambs showed 0.02 lb. greater daily gain, with the cost of

market gain reduced 70 ct. per hundredweight, but a market appraisal decrease of 30 ct. per hundredweight when compared with the check lot. The profit per lamb was 14 ct. greater in the phenothiazine-treated group than in the untreated group. There was little difference in profit in the untreated and the copper sulfate-nicotine-treated lambs.

The reticulo-endothelial system and immunity in hog-cholera, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Immunol.*, 39 (1940), No. 1, pp. 85-88).—In the study reported the mechanism which functions in immunity in hog cholera, presumed to be the reticulo-endothelial system, was not disturbed by blockading it with trypan blue. Pigs whose reticulo-endothelial systems appeared to be completely blocked could be immunized against hog cholera by the antiserum-antigen treatment as effectively as others in which no interference was attempted.

A hemophilia-like disease in swine, A. G. HOGAN, M. E. MUHRER, and R. BOGART. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 217-219).—Description is given of an affection of swine that has occurred for a number of years in a number of swine in the Missouri Station herd in which death has resulted from hemorrhage, either spontaneous or as a result of minor wounds. All of the affected animals were closely related. The symptoms resemble hemophilia more closely than any other known affection.

Incidence of *Trichinella spiralis* in garbage-fed hogs in San Francisco, J. B. McNAUGHT and E. M. ZAPATA (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 701-704).—Examinations made of the diaphragms of 495 garbage-fed hogs received in two abattoirs in San Francisco revealed 4.04 percent to be infected with *T. spiralis*. This figure is comparable with similar surveys of garbage-fed hogs in other areas of the United States but is 20 times higher than has been found in garbage-fed hogs in Canada, where garbage is cooked before feeding.

A note on the effect of large doses of phenothiazine on draft horses, L. E. BOLEY, C. C. MORRILL, and N. D. LEVINE. (Univ. Ill.). (*Vet. Med.*, 37 (1942), No. 1, pp. 26-29, fig. 1).—In a study of the effect of phenothiazine on Percheron horses, no significant change appeared in the urine or blood hemoglobin of an animal fed 80 gm. The blood hemoglobins of two horses fed 160 and 400 gm., respectively, were lowered, but no significant change in the urine constituents was observed. One horse with carcinoma of the penis which had been fasted for 5 days died 3 days after being fed 324 gm. of phenothiazine. A marked variation averaging 2.13 gm. per 100 cc. of blood was observed in the blood hemoglobins of untreated horses from one bleeding to the next, and the consequent necessity for repeated rather than single determinations in a study of the effect of phenothiazine on the blood hemoglobin was indicated.

Neutralizing antibodies against St. Louis and western equine encephalitic viruses in horses and fowl, B. F. HOWITT and W. VAN HERICK. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 247-250).—In continuation of earlier study (E. S. R., 86, p. 94), the authors report having found about 26 percent of 69 serums of encephalitic patients in the central valley areas of California to be positive to both the western equine virus and that of the St. Louis encephalitic type. In determining whether a similar relationship existed with animals, neutralization tests were performed on serums of domestic fowl and horses collected from endemic and presumably nonendemic areas of California. Antibodies against the St. Louis virus were found present in the blood of many horses and domestic fowl, and with a few exceptions they were in association with the neutralizing substance against the western equine virus. Of 43 unvaccinated normal horses and 2 recovered ani-

mals from the endemic regions of Kern, Fresno, and Yolo Counties, all except 2 showed neutralizing antibodies against the western equine virus. With the exception of 10, the serums were positive to the St. Louis virus as well, but none was positive to the latter alone. Serums were tested from 19 horses vaccinated against the equine strain in a northern California area. All were positive to the homologous virus but were negative to that of the St. Louis. Of 3 unvaccinated animals, 2 were negative to both strains and 1 weakly positive to the equine. Many of these horses had been imported from the East and therefore had not been long exposed to the western environmental factors. "It is difficult to decide as to the significance of the antibodies to both of these viruses among apparently healthy domestic animals, especially when it had been found that fowl without neutralizing substances were often insusceptible to either virus. . . . At present there is apparently a correlation between certain environments contributing the clinical disease in man and horses and the development of antibodies to both viruses in the blood of fowl and horses. A common vector or common reservoir may be responsible for both apparent and inapparent infections."

The infectious cycle of avian encephalomyelitis (epidemic tremor), E. L. MINARD and E. JUNGHERR. (Univ. Conn.). (*Jour. Bact.*, 42 (1941), No. 6, p. 817).—In the study here reported adult birds from known avian encephalomyelitis-infected flocks appeared to carry the virus. Typical histologic lesions resulted from intracerebral inoculation of chicks with suspensions of the ovary, oviduct, liver, and pancreas from 1 of 6 birds and filtered fecal suspensions from 26 of 66 birds from three flocks. Chick embryos inoculated with avian encephalomyelitis at various ages and by various routes proved susceptible. Thus the presence of the virus in tissues and feces of adult birds and its passage through the egg is indicated.

The pathology of equine encephalomyelitis in young chickens, E. E. TYZZER and A. W. SELLARDS (*Amer. Jour. Hyg.*, 33 (1941), No. 3, Sect. B, pp. 69–81, figs. 8).—Report is made of the pathology of the eastern type of the equine encephalomyelitis virus as studied in the mouse, guinea pig, young rat, vole (*Microtus pennsylvanicus pennsylvanicus*), deer mouse (*Peromyscus leucopus*), very young Rhode Island Red chickens, and several young adult ring-necked pheasants and common quail or bobwhite. Changes in the central nervous system in young rats and voles were in most respects quite similar to those found in the guinea pig by King (*E. S. R.*, 80, p. 398).

Hemorrhage control in Eimeria tenella infected chicks when protected by anti-hemorrhagic factor, vitamin K, F. M. BALDWIN, O. B. WISWELL, and H. A. JANKIEWICZ (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 278–280).—In the work reported the administration of vitamin K in the dietary of chicks definitely decreased the mortality in chicks parasitized by *E. tenella*, a hemorrhage-producing protozoan, since all autopsies performed show the vitamin K-protected birds had a fibrinated core in the ceca which was in the process of being reabsorbed. Vitamin K-protected birds showed a mortality of only 10 percent in comparison with 70-percent mortality in the unprotected group.

The modification of infectious bronchitis virus of chickens as the result of propagation in embryonated chicken eggs, J. P. DELAPLANE and H. O. STUART (*Rhode Island Sta. Bul.* 284 (1941), pp. 20).—The work reported, details of which are given in tables, shows that "infectious bronchitis virus can successively be obtained from the lower trachea of infected chickens bacterial-free and suitable for egg propagation purposes without passage through bacteriological filters. No distinctive or characteristic lesions of the embryo are noted during the first few egg passages of the field strain of the virus, although growth may be proved

to have occurred by permitting some of the inoculated eggs to hatch, in which instance some of the chicks will show the typical symptoms of the disease at the time of hatching. With each succeeding transfer the virus becomes more virulent for the embryo. The lesions noted are whitish foci on the liver, congestion and swelling of the kidneys, whitish opaque circular lesions on the chorioallantoic membrane (at the point where the virus is inoculated) of those embryos living for 3 or more days, and a tendency of the chorioallantoic membranes to appear thinner than normal and to adhere to the shell. Occasional hemorrhages will be noted scattered over the skin of the embryos, as well as marked smallness of sizes of the embryos. As the egg passages were continued, the embryo mortality was noted particularly on the fifth and sixth days; then the fourth, third, and finally the bulk of the embryos [was] killed by the end of the second day. The ability of the virus to kill embryos appears to become fixed so that no further changes in this respect are noted. This change occurs at about the sixty-fifth generation and remains constant up to and including the ninetieth transfer. The results as far as the effects on the embryos are concerned are substantially in agreement with the findings of Beaudette. No particular outstanding differences were noted with the B-588 virus as far as its effect on the embryo could be noted.

"The Rhode Island strain of the virus ceased to be virulent for baby chicks exposed by spraying or inoculation of the virus in the bursa at the eighty-ninth, ninetieth, and ninety-first passages. Chicks exposed to such a virus by spraying or inoculation of the bursa of Fabricius were susceptible to a virulent virus 10 days and 2 weeks following exposure to the attenuated virus, thus indicating that such an attenuated virus does not stimulate immunity by the methods employed. When inoculated in the nasal cavity, mild but typical symptoms of the disease were noted after a period of 2 weeks. The B-588 virus remained capable of inciting typical symptoms of the disease in baby chicks at the one hundred and twentieth to one hundred and twenty-fifth generation transfers (our eightieth to eighty-fifth transfer) during the winter months, indicating that seasonal variations may influence the activity of the virus. The reisolated virus from chickens infected with the B-588 virus failed to indicate that such a passage had caused it to revert to the field type as indicated by the results of egg inoculation tests. The virus survived storage in the fresh frozen state when kept frozen for 4 and 4.5 mo., but not for 5.5 mo. as indicated by egg tests. It survived when held at room temperatures for 5 to 7 days, but not for 14 days and at 50° C. for 5, 10, and 15 min. as indicated by egg inoculation tests."

The effect of intraperitoneal injections of carbon ink on the course of Plasmodium lophurae infections in chickens, W. TRAGER (*Amer. Jour. Hyg.*, 34 (1941), No. 3, Sect. C, pp. 141-149, figs. 2).—When 4- to 9-week-old chickens were inoculated with large doses of *P. lophurae* the parasite number usually reached a peak on the third day and then rapidly decreased. In similar chickens which received carbon ink in the posterior peritoneal cavity the parasite number continued to increase beyond the third day, reached a peak, usually higher than in control chickens, on the fifth day, and then fell off less rapidly than in untreated chickens. The course of the infection in the treated chickens resembled that seen in very young chicks, suggesting that the ink treatment interfered with the mechanism responsible for the age immunity observed in untreated older chickens.

A new drug effective against bird malaria, R. HEGNER, E. WEST, M. RAY, and M. DOBLER (*Amer. Jour. Hyg.*, 33 (1941), No. 3, Sect. C, pp. 101-111, figs. 9).—Experiments since 1922 in the search for a drug that would be equal to or

more effective than quinine in the treatment of malaria in birds led to the finding of such in the new drug hydroxyethylapocupreine dihydrochloride. Three species of bird malaria organisms were used in the experiments, namely, *Plasmodium lophurae*, Coggshall strain, in young Peking ducks; *P. relictum*, Coatney strain, in pigeons; and *P. cathemerium*, Hartman-Hewitt strain, in canaries. This drug was much less toxic than quinine hydrochloride, but the two were about equally effective against *P. lophurae* in ducks. Large doses of the new drug were more effective against *P. lophurae* in ducks than smaller doses, but very large doses were not much more effective than large doses. Administered orally or intravenously, it was effective against *P. relictum* in pigeons, and it was about as effective as quinine hydrochloride against this parasite in pigeons. The two drugs were also about equally effective against *P. cathemerium* in canaries.

Control of malaria infection (*P. lophurae*) in ducks by sulfonamides, H. A. WALKER and H. B. VAN DYKE (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 368-372).—Infection of the young Peking duck with *Plasmodium lophurae* usually progresses with rapid multiplication of the parasites in the blood and death after 5-16 days, as reported by Hegner et al. above, or 7-10 days, as found by the authors. When sulfonamides (sulfathiazole or sulfadiazine) are administered by incorporation in the food, the multiplication of parasites is checked after a few days and the birds survive at least several weeks with relatively few or, occasionally, no parasites in the blood. Sulfanilamide appears to be less effective.

Comparison of the egg production and rate of gain of birds negative and positive to the pullorum test, L. G. NICHOLSON and E. C. McCULLOCH. (Wash. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 1, p. 44, figs. 2).—In the comparison made six adult nonreactors selected from a farm flock and six reactors in a dilution of 1:100 to the whole blood serum plate and tube agglutination tests from the same flock, all selected at random, were placed in individual metal cages and received the same care. Daily records of individual egg production were made for 3 mo., and the averages for 10-day periods revealed the production of the reactor birds to have been from 8.4 to 44.7 percent lower than that of the negative birds.

Studies on the cultivation of *Sp[irochaeta] gallinarum*, I. J. KLIGLER and D. KAPLAN (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 103-106).—The results of a systematic study of the nutritive requirements of the causative organism of fowl spirochetosis are summarized. A description is given of the medium in which the organism can be cultivated without difficulty.

Studies on the occurrence, epidemiology, and inter-host relationships of nematode parasites of the chicken (*Gallus gallus*) in Alabama (*Alabama Sta. Rpt.* 1940, p. 43).—Further studies by R. O. Christenson are noted (*E. S. R.*, 85, p. 539).

Prevention and control of poultry diseases and parasites, W. J. PISTOR and C. F. ROWE (*Ariz. Univ. Expt. Cir.* 112 (1941), pp. [2]+33, figs. 6).

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations at the Colorado Station**] (*Colorado Sta. Rpt.* 1941, pp. 49-54).—Snow surveys (coop. U. S. D. A. et al.) are noted; also results of experiments with high-strength wire for reinforcing precast concrete beams, in which adequate reinforcement was provided by about one-half as much steel as is required in conventional design; photographic method of making snow surveys; and sugar beet machinery work, including single seed planters, experiments on mechanical thinning, and a variable depth planter.

Investigations of methods and equipment used in stream gaging.—Parts 1, 2, C. H. PIERCE (*U. S. Geol. Survey, Water-Supply Papers 868-A (1941), pp. IV+35, pls. 27, figs. 3; 868-B (1941), pp. IV+37-75, pls. 4, figs. 6.*)—In part 1, Performance of Current Meters in Water of Shallow Depth, the author reports upon an investigation made primarily for the purpose of determining coefficients to be applied as correction factors to velocities measured in very shallow water. The discharge as measured by the current meter was compared with weir or venturimeter discharge measurements to obtain the correction factor. Current-meter measurements over beds of smooth concrete, $\frac{3}{4}$ -in. gravel, and coarse gravel were investigated. Data from studies of pulsations, vertical velocity curves, distribution of velocities near the side walls of the flume, and performance of current meters near the water surface and near the flume walls were used in analyzing and interpreting the results of the discharge measurements.

In the work reported in part 2, Intakes for Gage Wells, about 90 different devices and arrangements of intakes were tested at the National Hydraulic Laboratory with respect to their performance and with reference especially to their effectiveness in eliminating draw-down. The results are tabulated. Several devices were selected by the laboratory committee of the Geological Survey for recommendation to the district engineers of the Survey as being effective in eliminating draw-down at stations for the measurement of stream flow. Working drawings of these show structural detail.

Geology of dam sites on the upper tributaries of the Columbia River in Idaho and Montana.—Part 1, Katka, Tunnel No. 8, and Kootenai Falls dam sites, Kootenai River, Idaho and Montana, C. E. ERDMANN (*U. S. Geol. Survey, Water-Supply Paper 866-A (1941), pp. V+36, pls. 7, fig. 1.*)—The Katka site, Boundary County, Idaho, appears to be the best natural location for a high dam to control the Kootenai River in the United States, but the favorable features are nullified by the presence of the railroad at low elevations. Tunnel No. 8 site, Lincoln County, Mont., has geologic and cultural conditions that make it unsuitable as a dam site. The Kootenai Falls sites, Lincoln County, Mont., have favorable geologic conditions and can be developed without endangering the railroad.

Geology and ground-water resources of the Balmorhea area, western Texas, W. N. WHITE, H. S. GALE, and S. S. NYE (*U. S. Geol. Survey, Water-Supply Paper 849-C (1941), pp. III+83-146, pl. 1, figs. 2.*)—The geology of the water-bearing formations is discussed, as are also the intake and discharge of ground water.

Surface water supply of the United States, 1939.—Part 1, North Atlantic slope basins (*U. S. Geol. Survey, Water-Supply Paper 871 (1941), pp. XIII+603, pl. 1.*)—This paper records measurements of stream flow in these basins for the year ended September 30, 1939.

Underground leakage from artesian wells in the Las Vegas area, Nevada, F. LIVINGSTON (*U. S. Geol. Survey, Water-Supply Paper 849-D (1941), pp. III+147-173, pls. 6, fig. 1.*)—From observations in 42 wells explored with a current meter designed for measuring the flow at various points in deep wells, it is concluded that the aggregate leakage from wells is not great enough to be responsible for more than a small part of the serious decline in water levels and artesian pressure in the basin. Great quantities of water are allowed to flow from the wells without being used beneficially or economically, however. It is believed that if the draft on the artesian basin were reduced and strict measures of conservation were applied, the pressure would increase noticeably, especially in the shallower sands.

Aids to judgment in irrigation, F. E. STAEBNER. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 4, pp. 129-131, 136, fig. 1).—The record of rainfall is an imperfect guide, but one that should not be entirely overlooked. In apple orchards it has been found that the rate of increase in the volume of the fruit may be a valuable index of the occurrence of moisture deficiency. Lemons have also shown retardation in rate of fruit growth when water shortage developed. The author suggests the use of a simplified form of atmometer, with no valve to prevent return of rainfall to the reservoir so that the effect of rainfall on the instrument may be more nearly like its effect upon the plant. He also discusses soil pressure and tension indicators and the electrical resistance ground-water meter.

Controlled drainage, D. H. HARKER. (Purdue Univ.). (*Agr. Engin.*, 22 (1941), No. 4, pp. 139-142, figs. 4).—The author outlines drainage systems so designed as to provide both adequate removal of water during spring rains and impoundment of drainage water at the end of the period in which drainage is required so as to prevent late summer drought. Dams in the open channels and stop wells in the tile systems are used where only the drainage water is available, but a supply of fresh water is also to be desired.

The dams must have floodway sufficient to pass the maximum discharge of the open channel, must go well into the banks and well below the channel bottom to prevent danger of damage to the structure, and must have lateral stability to withstand the water pressure and a paved spillway to prevent undercutting. Crest boards are preferred to bulkheads or vertical windlass gates. Such gates require considerable power for operation and almost constant attention and adjustment to maintain a desired water-table level. The stop well consists of a concrete box about 3 ft. square inside, as deep as depth of the tile line, or from 18 to 24 in. deeper than the outlet tile if a catch basin for silt is desired. Planks can be dropped into 2-in. wide grooves formed from the bottom to the top to form a dam crest. Materials and type of construction for dams are briefly considered, the conclusion being that, in general, a concrete structure with crest boards and a piling cut-off wall may be the cheapest and best when durability is considered. For low dams in small streams, wooden or corrugated sheet steel may best be used.

In addition to the prevention of drought injury to crops, controlled drainage has, in muck soils, the advantages of control of wind erosion and the lessening of the danger of muck fires.

Equipment for terrace construction, J. T. McALISTER. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 4, pp. 147-148, figs. 3).—The author calls attention to the great magnitude, in the aggregate, of the earth-moving job involved in the adequate terracing of the farms of the United States, defines the requirements of the drainage-type terrace, now the most commonly built terrace in the southeastern area, and discusses recent developments and relative suitability of the implements and machines used. Since 1933 heavier equipment, drawn by track-type tractors of from 40 to 50 hp., has been replacing some of the light horse-drawn and farm-tractor equipment in connection with efforts to accelerate progress of the soil conservation program.

Terrace construction and maintenance, while representing a great undertaking in the aggregate, are relatively simple problems of the individual farm. Best results are obtained when the work required becomes a part of the regular farm operations. Since terrace construction is basically a problem of earth moving, any type of equipment selected for this purpose should be evaluated on its capacity for economical movement of earth under the varying soil conditions encountered.

Physical reactions of tillage tools causing compression and arch formation, and analyses of plow moldboard shapes and materials (Alabama Sta.

Rpt. 1940, p. 16).—A new method of measuring and studying compression and arch action developed by F. A. Kummer.

Harvesting grain sorghums, F. C. FENTON. (Kans. State Col.). (*Agr. Engin.*, 22 (1941), No. 4, pp. 137-138, 142, figs. 4).—The grain sorghum produces grain in a head held well above the leaves so that hand or machine methods of harvesting are easily performed. Hand topping is considered practicable for small acreages and was reported as the method used for harvesting half of the crop in the Southwest in 1927, but mechanical harvesting has increased since that date, mainly because of the now almost universal use of the combine for wheat. The author discusses also the standard row binder, described as the most practical method for the tall varieties grown for forage as well as for grain; the header, a very successful harvesting method for dwarf varieties but less used than formerly because the header has almost gone out of use in wheat harvesting; and the combine harvester, the use of which is extensive for wheat and therefore desirable for grain sorghums. To prevent throwing the heads from the platform, the reel slats may be widened by adding wide pieces of light-weight siding. The header-dump box combination developed at the Fort Hays Substation has been used successfully for a number of years. The piles dropped by the dump box are placed in windrows for ease in threshing. The combine is pulled along a row of these piles, and the heads pitched onto the platform canvas. Lodging caused by strong winds after a heavy freeze drops a rather large percentage of the grain below the reach of the combine, and efforts to avoid this loss have resulted in some combining before the grain is dry enough for safe storage. Cylinder speeds should be reduced to from two-thirds to three-fourths of those used for wheat threshing to avoid cracking. Both the angle-bar and the rasp-bar types of cylinder have given good results in threshing sorghums and appeared to crack less grain under most conditions, if properly adjusted, than did the tooth cylinder and concave. Combines having the rasp-bar type of cylinder will crack a large part of the grain if set too close and run at high speed, however.

Machines designed for harvesting and storing grass silage, H. E. BESLEY and W. R. HUMPHRIES. (N. J. Expt. Stas. and U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 4, pp. 125-126, figs. 5).—The grass-silage crop weighs about three times as much as field-cured hay, and pitching it is laborious. Hay loaders have been so redesigned as to give little trouble in loading green grass. The tractor mower cutting a 6-ft. swath will keep three trucks and a loader busy. Cutting grass silage with a standard grain binder, eliminating need for the loader, has been successfully tried, especially with timothy and the small grains. When gathering from the swath, loaders tend to pick up from adjacent swaths, especially hillsides. This tendency may quickly build up, resulting in clogging and possible damage. Most cutters are considered to be now equipped for handling grass silage satisfactorily, whether pitched from a load or from the ground. Molasses used as preservative caused less inconvenience when applied above the shear plate or at some other point in the fan housing rather than at or ahead of the feed roll. Field choppers were found to save labor but to cost too much, at present, except for large-scale operations. The new small harvester having feeders of a small combine and serving as mower, chopper, and loader is considered capable of going a long way in reducing the cost and hard labor involved in the production of grass silage. Tests made in New Jersey with an experimental model during the past summer indicate that the outfit operated by two men can harvest from 3 to 5 tons of second-cutting alfalfa an hour. Later tests with an improved model showed much greater capacity. Work with an experimental elevator of the drag type, with

flights enclosed, showed that fast-moving lifts knock out considerable material when fed from the front either by gravity or from the feed table. Slower speeds reduced the throwing of the silage but introduced wedging difficulties. Performance of some promise was obtained by entirely enclosing the elevator at the bottom and feeding from the side, between the flights, above the point of enclosure. A metal housing was provided without clearance between the housing and travel of the lifts.

A practical seed-cotton moisture tester for use at gins, G. E. GAUS, C. S. SHAW, and W. H. KIEVER (*U. S. Dept. Agr. Cir. 621 (1941), pp. 26, figs. 11*).—The tester is designed to register the hygrometric condition of the air confined within a mass of seed cotton by means of wet-bulb and dry-bulb thermometers, over which the air to be tested is drawn by suction provided by a vacuum cleaner. Drawings and a bill of material for the construction of the tester, from standard pipe fittings and inexpensive accessories, are included. A conversion table gives equivalent moisture content corresponding to the range of relative humidities indicated by the tester when used with seed cotton. A coefficient of correlation with drying-oven moisture determinations of 0.94 and a standard error of estimate of 1.48 percent were found.

A moisture-content calculator employing a set of adjustable wet-bulb and dry-bulb temperature integrating scales for direct reading of corresponding moisture content from temperature readings made with the moisture tester is also described. A bill of material and specification for the construction and assembly of the calculator are included, and it is shown in photographs but not in working drawings.

Set-up in rural electrification technology needed, S. P. LYLE (U. S. D. A.). (*Agr. Engin., 22 (1941), No. 4, pp. 135-136, fig. 1*).—This brief discussion emphasizes the need for an increased rate and volume of technological investigation to keep pace with the rapid progress of the rural-electrification project as a whole. Without this increase in research the growth of rural electrification will be retarded or checked.

Needed research on southern farm buildings, W. V. HUKILL (U. S. D. A.). (*Agr. Engin., 22 (1941), No. 4, pp. 127-128, figs. 2*).—This is a brief, general discussion of subjects needing investigation as they are brought out by letters of inquiry, etc. These include moisture control, use of building materials, sanitation, and the general requirements to be met in storage houses, in livestock buildings, and in other structures. While these subjects are more or less interrelated, each includes a number of items which should be included in any list of needed research. The larger problem of actually getting improvements on farms where they are needed is implied in all the inquiries and needs special attention.

Hog barn heating and ventilation, A. SEVERSON (*North Dakota Sta. Bimo. Bul., 4 (1941), No. 2, pp. 13-14*).—To prevent concrete floors from becoming too cold, especially during farrowing, the author used warm-air runways under the floor. Those here described were placed 1 ft. apart, each was made 18 in. wide and 8 in. deep, and the ducts were placed 4 in. below the surface. Air heated by a stove at one end of the barn was driven through these ducts by a booster fan and was returned to the furnace. The ducts were placed under the farrowing pens and were designed to maintain a floor temperature of about 102.5° F., the body temperature of the animal. The importance of insulating the foundation walls, as, for example, with a 2-inch layer of mixed asbestos powder, vermiculite, and cement poured inside the foundation walls, is emphasized. Heating and ventilation should be carefully considered either in building a new hog house or in remodeling an old one. Draftiness must be avoided, but building up an excessive concentration of carbon dioxide and too a high humidity through inadequate ventilation may cause pneumonia.

The all-electric greenhouse, J. ROBERTS and S. E. WADSWORTH (*Washington Sta. Bul.* 404 (1941), pp. 22, figs. 13).—This bulletin mentions the lean-to, the separate all-glass, and the insulated types of electric greenhouses but is mainly concerned with the construction of the last-named type. A bill of materials for a standard 8- by 12-ft. house shows also the additional quantities of each dimension of lumber and of other materials required for each 3-ft. increase in length. The unit described is to be framed of 2- by 4-in. lumber. All-weather plywood is to be applied inside and outside the frame, insulation being placed between the two plywood layers. Working drawings show the detail of construction. Heat was found to be satisfactorily supplied by a 1,300-w fan air heater and two 400-w soil-heating cables laid one in each soil bench. The heating elements are to be thermostatically controlled. Data obtained in tests of electric-power requirement are tabulated. The approximate costs of construction are given. Related topics taken up are soils for the greenhouse bench, flowers suggested for the small electric greenhouse, vegetables, artificial light, and suggestions for operating the electric greenhouse.

Housing requirements for curing tobacco, J. M. CARR. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 4, pp. 133-134).—The author outlines the flue-curing process and points out the need for improvement in design both of buildings and of heating equipment, the buildings needing, especially, better insulation and the heating equipment an application of known principles of drying technic, avoiding formation of "chimneys" in the tobacco due to poor heat distribution and resulting in still less uniform drying. The fire hazard is especially emphasized, as is the need for protecting the cured leaf from wide variations in temperature and humidity and from direct or strong light. Similar problems relating to air curing, buildings for grading, etc., are noted.

Some development trends in the farm freezing and storing of food, G. W. KABLE (*Agr. Engin.*, 22 (1941), No. 4, pp. 143-146, figs. 2).—The author considers that not all of the farm-frozen products are as good as those which have been grown, harvested, and frozen under expert commercial supervision, but in most cases frozen farm products have been much more acceptable than the same products canned. He summarizes current practice in this type of food preservation and marketing.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Alabama Station, 1940] (*Alabama Sta. Rpt.* 1940, pp. 7, 8-15).—Included are some findings, usually in the form of a summary table with discussion, for studies made in Marion County, by B. T. Lanham, Jr., and W. F. Lagrone, on use of short-term farm credit; availability and use of farm family labor; variations in annual work stock costs by size of farms; investment in land and buildings by size of farms; farm machinery and equipment by size of farms; credit advances to sharecroppers; approved soil-building practices carried out; and farm costs of operating automobiles and trucks.

[Investigations in agricultural economics by the Colorado Station, 1941] (*Colorado Sta. Rpt.* 1941, pp. 45-46).—Included are: (1) Brief general findings based on analyses of financial records and feed-lot costs for lambs and cattle in the irrigated districts of the northern parts of the State; (2) findings as to net cash income, total net farm gain, average yields of corn and wheat, etc., in 1939 on 20 first-grade dry-farm operating units in northeastern Colorado; and (3) findings as to average cash farm receipts, cash farm expenses, and farm living expenses in 1939 as shown by the records of 50 U. S. D. A. Farm Security Administration clients.

Current Farm Economics, [December 1941] (*Oklahoma Sta., Cur. Farm Econ., 14 (1941), No. 6, pp. 161-203, figs. 10*).—In addition to the usual discussion of the agricultural situation and usual tables of indexes, etc., articles are included as follows: World War II, by R. T. Klemme (pp. 169-173), discussing some of the problems the war presents to agriculture; Export Trade and American Agriculture, by G. P. Collins (pp. 173-184), discussing briefly the early development in agricultural exports, the present status, and the outlook; and Conservation on Small Cotton-Corn Farms, by E. A. Tucker (pp. 185-199), which summarizes and discusses some of the findings in a study of the Pecan Creek Demonstration Area of Muskogee County.

Foreign Agriculture, [November-December 1941] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 5 (1941), Nos. 11, pp. 443-488, figs. 2; 12, pp. 489-534, figs. 6*).—No 11 includes an article on Agriculture in the Argentine Trade Agreement, by L. C. Nolan (pp. 445-468), discussing the background of the Argentine-United States trade and the agricultural concessions granted to Argentina and the United States in the trade agreement effective November 15, 1941; and an article on Mexican Vanilla Production and Trade, by L. D. Mallory and W. P. Cochran, Jr. (pp. 469-488).

No. 12 includes articles on The Agricultural Economy of Colombia, by K. H. Wylie (pp. 491-514), and The Japanese Silk Industry Faces a New Crisis, by W. I. Ladejinsky (pp. 515-534).

Classification of agricultural areas, Frederick County, Maryland, R. W. HARRISON and P. L. SEARFOSS. (Coop. U. S. D. A.). (*Maryland Sta. Bul. 440 (1941), pp. 225-266, figs. 10*).—The main objective of the study was "to develop a method of land classification which can be used efficiently and expediently under the wide range of conditions which characterize the agriculture of the State of Maryland." Information included in about 200 farm schedules obtained in 1939 in Frederick County, information on Farm Credit Administration schedules for about 2,500 farms in the county, and land classification maps previously prepared by the County Land Use Planning Committee, and the Farm Credit Administration Maps are presented and discussed, showing for the county climatic data, topography and erosion, soil characteristics, soil productivity ratings, types of farm land use, agricultural production, gross farm income, size and condition of buildings, and social conditions. Of these nine factors the following were found to be of the most practical value for classification of agricultural lands: Topography and erosion; soil productivity ratings; percentage of land in crops; agricultural production (indexes of crop yields and numbers of livestock); condition of buildings; gross farm income; and assessed values (as an index of social conditions). "Data representing each of the seven factors mentioned above were plotted on individual maps having a scale of 1 in. to 1 mile. Area of homogeneous characteristics were delimited on the several maps. In order that every part of the county might be systematically covered in the final appraisal, an outline map of the same scale as the several factor maps was ruled into 1-in. squares. By placing this outline map over the separate factor maps, the detailed characteristics of each 1-in. unit of area were entered in code by the use of the weighting system shown in [a table]. The weights in this table and the class intervals derived therefrom are the result of numerous statistical studies of the interrelation of factors. Some of these relationships are shown in table and map form in this bulletin. The limitations of space prevented a complete presentation of all of the statistical data."

Five classes of agricultural land in the county, in addition to nonagricultural and residential areas, are delimited and are described and mapped.

The appraisal of farm buildings, J. C. WOOLEY and R. P. BEASLEY (*Missouri Sta. Cir. 213 (1941), pp. 10, fig. 1*).—Tables and a chart are included, showing the classification of buildings, constants for use in determining cost per cubic foot of different types of buildings, depreciation rates for farm buildings, soil-productivity classification for Missouri, acres of pasture and crops on different classes of land required to support one animal, and building-space requirements for different animals. The use of these data in determining structural value, place or use value, and appraised value are discussed and illustrated.

A study of farm organization by type of farm in Sanpete and Sevier Counties, W. P. THOMAS, G. T. BLANCH, and E. HAYBALL (*Utah Sta. Bul. 300 (1941), pp. 75, figs. 5*).—This study is one of the series (E. S. R., 77, p. 553) "designed to furnish a general description and a detailed analysis of the type of farming in various parts of Utah." Part I is a general description of Sanpete and Sevier Counties and their agricultural resources, in which the number, size, and types of farms, the transportation and marketing facilities, landownership and use, crop acreages and yields, numbers of livestock, etc., are discussed.

Part II is based upon farm business records for 1936 for 270 farms in the two counties. In the first section an analysis is made of the records for 187 general irrigated farms classified on a county basis. In the second section analysis is made of the 270 records to compare the 5 major types of farming and to ascertain the factors affecting the success of each type. The 270 farms included 187 general irrigated farms, 28 beef cattle ranches, 32 sheep ranches, 10 lamb-feeding enterprises, and 13 part-time farms. The labor income on general irrigated farms averaged \$172 for Sanpete County and \$303 for Sevier County, and in addition the operators had farm privileges valued at \$285 in Sanpete County and \$332 in Sevier County. For the two counties, the average labor incomes on the different types of farms were: General irrigated farms, \$222; beef cattle ranches, —\$139; sheep ranches, \$1,697; lamb-feeding, \$508; and part-time farms, —\$87. Some of the findings were: "On general irrigated farms, there was a positive relationship between size of farm business, labor efficiency, crop yields, and labor income. . . . On the beef cattle farms studied, there was no significant relationship between size of unit and labor income. A negative relationship between number of beef cattle per farm and labor income was found. . . . A consistent relationship was shown between labor income and crop yields. The labor income for the group of farms with crop index of more than 125 averaged \$172, as compared to a labor income of —\$470 for farms with a crop index of less than 75."

For the sheep ranches an operating unit of 1,096 productive man-work-units was favorable to economic production. For the part-time farms, the factors affecting profits were: Small size of farm business, low labor efficiency, and low rates of production.

Farm business summary, Michigan, 1940, C. O. MAY and J. C. DONETH (*Michigan Sta. Quart. Bul., 24 (1941), No. 2, pp. 132-144, figs. 3*).—Farm account records for 1940 for 1,263 farms are summarized in tables showing by items the average capital investment, receipts, and expenses. Charts show the number and percentage of farms in different labor income groups and the relationship between the ratio of Michigan farm prices to farm costs and labor income, 1929-40. Other tables compare the financial returns on Michigan farm-account farms for the years 1929-40, inclusive; present the financial summary of the 1940 farms by type-of-farming areas; and give data for 1940 by type-of-farming areas as to kinds, acreage, yields, etc., of crops; kinds, amounts, and returns from livestock; and expenses and efficiency factors (labor, machinery, improvement, and other costs).

An economic study of the organization and management of beef cattle and other types of farms in Russell County, J. J. VERNON. (Coop. U. S. D. A.). (*Virginia Sta. Tech. Bul. 71 (1941), pp. 186, figs. 10*).—Analysis is made of records for the year ended September 30, 1935, obtained by the survey method for 226 beef and 272 nonbeef farms in Russell County. Records were not obtained for farms of less than 10 acres of crops unless some beef cattle were kept. The problems, the regional conditions, the economic conditions in 1934–35, and the agricultural development in the area are discussed. Analysis is made of the effects of size of business, productive efficiency, labor efficiency, capital efficiency, and the balance of these factors on the variations in the returns from the farm business. Analysis is also made of the factors affecting the costs and returns from the beef cattle enterprise and the cost of producing calves and raising replacement cows. The data and the analyses are presented in 132 tables and 8 charts, and are discussed in considerable detail.

Management practices with large lima beans in southern California, W. SULLIVAN, W. M. CORY, and M. D. MILLER (*California Sta. Bul. 657 (1941), pp. 30, fig. 1*).—This is an analysis and summarization of 161 records obtained during the period 1932–39 in enterprise-efficiency studies conducted by the Agricultural Extension Service of the University of California in Ventura and Orange Counties. Eighty-six records cover land operated by tenants and 75 land operated by owners. Irrigation costs were reported on 113 records. The production of large and baby lima beans, the factors limiting production, marketing, prices, etc., are discussed. The principal part of the report consists of tables with discussion giving (1) a general summary of yields, income, and costs by years 1932–39, in which the yield and income are separated into recleaned beans, cull beans, and bean straw, and the costs are grouped into the major items of cultural and harvest labor and field power, material used, cash overhead, depreciation, and interest on investment or rent; and (2) more detailed tables showing by years the average cost per acre of man labor and field power for land preparation, planting, cultivating, and harvesting, for materials and supplies, for overhead costs, and for capital investment, interest, and depreciation. Other tables show rental costs and the monthly prices, September 1920 to August 1940, of large lima and baby lima beans, f. o. b. California. A standard of inputs of labor, materials, and costs under specified conditions on a typical owner-operated, 100-acre irrigated farm having better-than-average management is presented.

Economic aspects of the distilling industry in Maryland, S. H. DEVAULT, W. P. WALKER, and R. W. HARRISON (*Maryland Sta. Bul. A3 (1941), pp. [4] + 73–89 + 2, figs. 7*).—The data for this study made in 1940 were obtained by personal interviews with distillers and questionnaires sent companies whose main offices were outside the State. Facts are included as to number of persons employed, total wages and salaries, investment, materials used, the relation of distilling to other industries, stocks and production of the distilling industry of the State, public revenues from distilled spirits, and similar subjects.

The distilling industry in Maryland had a capital investment of over \$37,000,000, employed about 1,727 persons, and paid about \$2,300,000 in wages. About \$7,633,000 is spent annually for supplies, of which \$2,273,000 is for grain. The production of raw spirits amounted to 11,862,632 proof gallons during the year studied. The industry paid taxes, or assumed obligation for taxes, amounting to over \$30,000,000 during the year.

Efficiency in the use of farm machinery in Arizona, N. O. THOMPSON (*Arizona Sta. Bul. 174 (1941), pp. [4] + 257–278, figs. 4*).—This bulletin is based on an analysis of (1) detailed machinery cost and operating records for 34 farms

in the eastern part of the Salt River Valley for 1 yr. beginning in the fall of 1939, and (2) a survey of machinery investment and practices followed in other parts of the Salt River Valley, Casa Grande Valley, and the Yuma area. The 34 farms for which records were obtained were mostly diversified 30- to 600-acre farms on which the major crops were cotton and alfalfa. Forty-three tractors ranging from 9.8 to 26.8 drawbar hp. were owned by the farmers. Analysis is made of the tractor cost per hour of operation and the machinery and labor cost for plowing, floating, disking, bedding, and planting row crops, cultivation, stalk cutting, bordering, harrowing, renovating, seeding small grains, hay making, etc., and these costs are compared with the prices charged by contractors. Analysis of machinery investment on irrigated farms and suggestions for the machinery for typical types of irrigated farms are made.

The average costs per hour for operating general-purpose tractors were: 9.8-13 hp., 2-row, 64 ct.; 15.5-16.9 hp. (mostly 4-row) 85 ct.; and 18.1-26.8 hp., \$1.17.

"Cost comparisons indicated that ordinarily it was to the farmers' advantage to contract their plowing, subsoiling, and renovating to custom operators. In many instances where the land was custom-plowed it was necessary to hire the land floated as well because of its rough uneven condition. Other tillage operations of disking, cultivating, bordering, bedding, and harrowing were usually performed cheaper by the farmer using his own equipment. Such operations as stalk cutting, planting of row crops, and drilling of small grains—operations requiring machinery that is used only a few days each year—were cheaper to contract when the acreage involved was small, unless such machinery was rented or owned jointly with a neighbor. The farmer's decision on whether or not to contract his mowing and raking of hay or own the necessary equipment seemed to depend more on the relative importance of alfalfa in the cropping system than on the size of the acreage involved.

"The average machinery investment per crop acre for different sized farms was as follows: Less than 80 crop acres, \$20.53; 80-159 crop acres, \$15.02; 160-239 crop acres, \$10.02; 240-319 crop acres, \$10.19; 320 and more crop acres, \$7.82. From this it was evident that farms of less than 160 crop acres tend to operate at a machinery-cost disadvantage."

Quality-price relationships of cotton at local markets in Oklahoma, T. R. HEDGES (*Oklahoma Sta. Bul. 250 (1941), pp. 35, figs. 8*).—This investigation has revealed that a policy of paying producers a set price for all grades of cotton, rather than varying prices for individual bales of cotton according to their quality, is detrimental both to the cotton grower and to the cotton industry. It either penalizes producers of premium cotton, subsidizes producers of low-quality cotton, or does both, thereby encouraging producers to increase the proportion of low-quality cotton in the total crop; makes it harder and harder to find a market for Oklahoma cotton; and forces the ginners to offset the losses incurred through transactions in cotton with earnings from other departments of their businesses and thereby produces an artificial market for cotton.

Cooperative grain elevators in North Dakota and eastern Montana, H. E. RATCLIFFE, P. V. HEMPHILL, and H. F. HOLLANDS. (Coop. N. Dak. Agr. Col. and Mont. State Col.). (*U. S. Dept. Agr., Farm Credit Admin., Coop. Res. and Serv. Div., Bul. 43 (1941), pp. VI+58, figs. 22*).—The authors found that the number of member-patrons was closely related to volume of grain handled. Membership may be enlarged by selling shares of capital stock with a low par value. Current assets averaged 1.6 times current liabilities for the eastern area compared with 2.6 for the western area. The amount of side line sales in the eastern area showed no appreciable change during the 3-yr. period 1935-36 to 1937-38, while in the

western area such sales increased considerably and were larger and of greater importance in influencing operating results. Side lines in the eastern area included coal, twine, feed, flour, lumber, seeds, and petroleum. Cooperative elevators in the area studied required a minimum annual grain volume of approximately 100,000 bu. to meet operating expenses, provide for necessary services for patrons, and protect their capital structure. When grain volume was not that large, a total business volume of more than \$100,000 annually was needed. Even large business volume does not assure net savings unless unit costs are kept to minimum. Other factors influencing elevator operation were efficiency in the use of labor and extent to which the elevator facilities were used.

Budgeting in Texas counties, 1931-1940, H. C. BRADSHAW (*Texas Sta. Bul. 603 (1941), pp. 33, figs. 3*).—"The purpose of this study is to examine the results which have been obtained by Texas counties under the uniform budget law passed in 1931." A sample including 60 of the 254 counties of the State was studied for the calendar year 1935. Schedules were also obtained for 26 of the same counties for the calendar year 1939. Information was obtained from the official copies of budgets filed with the State comptroller, from field audits made by the Highway Planning Survey, and interviews with county officials. The provisions of the law, the budget form, and the compliance with the law are discussed. The budgeted or estimated receipts and disbursements in 51 of the 60 counties that filed budgets are compared and discussed. Sections are devoted to the discussion of the content and arrangement of budgets and the essentials of a good county budget.

During the 6-yr. period 1935-40, an average of 207 or 82 percent of the counties of the State filed budgets annually. One group of 139 counties filed a budget each year and 11 counties filed no budgets during the period. Of the 231 funds in the 60 counties studied in 1935 the expenditures were less than the income for 83.1 percent of the funds. For the 100 funds in the 26 counties studied in 1939 the percentage was 92 as compared with 84 for the same counties in 1935.

RURAL SOCIOLOGY

[Investigations in rural sociology by the Colorado Station, 1941] (*Colorado Sta. Rpt. 1941, pp. 47-48*).—The following topics are briefly discussed: Some health practices and attitudes and related problems, farm population and farm population movements, youth problems, and beet labor problems.

The transmission of farming as an occupation, W. A. ANDERSON (*[New York] Cornell Sta. Bul. 768 (1941), pp. 29, figs. 4*).—Important conclusions, based on three samples from the farming and nonfarming populations of New York State, were that farming as an occupation is transmitted from fathers to sons to a greater extent than are nonfarming occupations. Farming is self-perpetuating, being carried on from generation to generation chiefly by sons already engaged in it. This occupation is inherited most commonly by the oldest son in the family. There is no evidence that farmers' sons are less successful in entering positions of equal rank with nonfarmers' sons.

Farmers study their communities in Hand County, South Dakota, R. L. McNAMARA. (Coop. So. Dak. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. [3]+27, figs. 8*).—The primary purpose of this report was to outline a procedure whereby farm people in a given county may study and delineate the neighborhoods and communities in their own areas. The task of community study was worked out by the farmers themselves. Among the matters studied were population changes, service and nationality areas, schools, and churches. The results are presented by maps and tables and discussed in considerable detail.

Neighborhoods and communities in Covington County, Mississippi, H. HOFFSOMMER and H. PRYOR (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. [1]+31, figs. 9*).—While this study revealed that the boundaries of the communities, and in some instances even the location of the centers in this cut-over pine sections, had changed, it was found that neighborhoods and communities remained and that those of today are the descendants of these earlier stages of development. By noting these trends it was possible to forecast in some measure developments that will occur in the future in enabling farm people to make plans accordingly.

Culture of a contemporary rural community, El Cerrito, New Mexico, O. LEONARD and C. P. LOOMIS (*U. S. Dept. Agr., Bur. Agr. Econ., Rural Life Studies No. 1 (1941), pp. [IV]+72, figs. 20*).—This is the first of six analyses of the factors affecting community stability and instability by the participant observer method.

"The village of El Cerrito is a singular example of a group of people that has maintained its individuality in the face of the ever-increasing forces that have been brought to bear upon it. Not only has it failed to keep in step with modern technological progress but it has managed to exist in its own way after the greater part of its economic base had been lost. In this respect, as well as in many others, it is highly representative of a large number of other native villages that lie in the area of the Pecos watershed. Definitely submarginal to date in its capacity to support the present population, it is highly integrated and unified socially, functioning in many instances as a single unit."

Cut-over lands of western Washington: A study of settlement experience and opportunities, C. P. HEISIG. (Coop. Wash. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., Migration and Settlement Pacific Coast Rpt. 6 (1941), pp. [2]+68, figs. 10*).—More than one-half of the 1,051 families living in the five local areas studied had taken over their farms after 1929. About one-half of these settlers were from the State of Washington, while slightly less than one-half of those from outside of Washington, or 22 percent of all new settlers, came from the Great Plains. Discussion included size of farm, farm income, source of funds used in family living, living conditions, land clearing, alternative methods of rendering settlers assistance, the importance of land selection, and probable needs for development.

New settlers in Yakima Valley, Washington, C. F. REUSS and L. H. FISHER. (Coop. Wash. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., Migration and Settlement Pacific Coast Rpt. 8 (1941), pp. [3]+47, figs. 8*).—Substantially identical with Washington Station Bul. 397 (*E. S. R.*, 86, p. 118).

Building rural communities (*Amer. Country Life Conf. Proc., 23 (1940), pp. [4]+171*).—The following papers were presented at La Fayette, Ind., November 6-9, 1940: *Rural People and World Peace*, by H. C. Taylor (pp. 22-31); *The Rural Community's Role in Program Planning*, by N. T. Frame (pp. 32-37); *Organizing Community Meetings*, by D. E. Lindstrom (pp. 38-40) (*Univ. Ill.*); *Rural Schools Are Awakening to Community Needs*, by I. E. Schatzmann (pp. 41-43); *The Rural School and the Rural Community*, by F. Martin (pp. 44-47); *Community Education—A Challenge to All*, by H. Mittelholtz (pp. 48-54); *Shepherds' Pipes at Olive Branch*, by C. Meyer (pp. 55-58); *Helping Girls To Help Themselves*, by M. L. Jesse (pp. 59-60); *Activities Relative to Rural Environment as Carried on at the State Teachers College, Mayville, North Dakota*, by E. V. Johnson (pp. 61-62); *Parke County's Correlated Program*, by G. Alexander (pp. 63-68); *Rural Community High Schools*, by V. H. Sorenson (pp. 69-76) (*Univ. Wis.*); *A Rural Community and Its School Resources*, by

M. L. Smith (pp. 77-84); The Importance of Books in Rural Communities, by J. W. Merrill (pp. 85-86); American Music and Folk Dances, by S. A. Anderson (pp. 87-90); Expressions of Rural Art, by E. E. May (pp. 91-95) (Univ. Minn.); Releasing Creative Abilities Through Dramatic Expression, by O. M. Biddison (pp. 96-101); Building Rural Communities Through Our Schools, by I. E. Schatzmann (pp. 102-105); Georgia Begins an Experiment, by O'D. Mays (pp. 106-107); National Parley Takes Stock of the Rural Community, by E. L. Kirkpatrick (pp. 108-111); Taking a Look at a Rural Community, by I. Meier (pp. 112-119); The Rural Community and the Needs of Youth, by L. Clark (pp. 120-129); Older Youth's Relations in the Rural Community, by R. Polson and R. Clark (pp. 130-137) (Cornell Univ.); Program Helps Discussions, by A. M. Boynton (pp. 138-146); Barron County, Wisconsin, Planning Committee, by K. Jacobson (p. 147); Blackford County, Indiana, Country Life Club, by L. Walker (p. 148); Ross County, Ohio, Rural Youth Group, by G. Roe (p. 149); The Responsibility of Youth for Building Communities—as Seen by Youth, by R. Coleman and M. Andrew (pp. 150-158); and The Negro's Contribution to American Folk Songs, by C. Elliott (pp. 159-160).

The challenge to democracy.—VI, Toward a new rural statesmanship, E. D. Ross (*Iowa Sta. Bul. P26, n. ser. (1941), pp. 701-716*).—This discussion of rural leadership is the sixth of a series on democracy.

County government in Washington, C. F. REUSS (*Washington Sta. Bul. 400 (1941), pp. 62, figs. 10*).—This is the third of a series on rural social institutions (E. S. R., 81, p. 589; 84, p. 411). It deals with the services performed, backgrounds of Washington counties, the administrative personnel, an analysis of financial operations, and suggestions for the reconstruction of county government in the State.

A descriptive study of the rural and small city relief population in Oklahoma, T. G. STANDING (*Oklahoma Sta. Bul. 251 (1941), pp. 23*).—Information is presented descriptive of the relief population in comparison with the general population in the nine counties included in this study.

"Aside from emphasizing the magnitude of relief needs in rural areas, one of the most outstanding facts which emerges from this study is the essential similarity of the relief population to the general or total population. It is true that relief families are slightly larger and that the relief group as a whole is somewhat younger and less well educated than the general population. But when these and other possible differences are taken into account, the fact remains that a major proportion of all persons receiving relief are indistinguishable from the rest of the population except in regard to economic status."

Virginia's marginal population: A study in rural poverty, W. E. GARNETT and A. D. EDWARDS (*Virginia Sta. Bul. 335 (1941), pp. 166, figs. 54*).—The authors conclude that around 100,000 white families or between one-third and one-half of the white rural population and a still larger proportion of the Negroes, even in normal times, may be classed as marginal. The 1930 census data showed that 35,752 or 38 percent of the white farm owners, 19,291 or 65 percent of the white tenants, 16,628 or 69 percent of Negro owners, and 9,734 or 69 percent of Negro tenants had gross incomes of less than \$600. The authors discuss the extent, composition, and location of the marginal population and factors contributing to marginality, including background, economic and social, institutional, and biological factors. A number of family case histories are presented. A disproportionate increase of the marginal standard population is also shown. Corrective measures are suggested.

The pecan shellers of San Antonio, S. C. MENEFEE and O. C. CASSMORE (*Washington: Fed. Works Agency, Work Proj. Admin., Div. Res., 1940, pp. XIX+82*,

[*pls. 5*], *figs. 3*).—This report presents the problem of underpaid and unemployed Mexican labor in the pecan shelling industry in San Antonio, Tex.

Station project reveals clue to "unknown quantity" in improving health for defense, R. W. ROSKELLEY and B. YOUNG (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 4, pp. 5-6).—The authors found that "a relatively large proportion of the population considered does not follow certain recommended practices of dental hygiene and sanitary measures which have been defined as essential for healthful living. . . . In general, with but slight variation, children follow the pattern of their parents with respect to both dental and dietary practices. . . . The possession of a garden seemed to have a definite influence on the frequency with which certain vegetables were eaten in the summer months but not in the winter months." The importance of educating the homemaker as a means of improving health practices in families is emphasized.

[**Virginia rural youth survey**] (*Virginia Sta., Rural Sociol. Rpts. 13* (1940), pp. [23], *figs. 2*; 14 (1940), pp. [6]+64, *pls. 4*, *figs. 14*; 15 (1940), pp. [6]+28, *figs. 4*; 16 (1941), pp. [74], *figs. 9*; 17 (1941), pp. [59], *figs. 8*; 18 (1941), pp. [32]; 19 (1941), pp. [17], *figs. 7*).—These reports give information on the following subjects: No. 13, The Virginia Rural Youth Survey: A Progress Report and Related Questions, by W. E. Garnett and A. D. Edwards; No. 14, Youth in a Rural-Industrial Situation, Spencer-Penn Community, Henry County, Virginia, by A. D. Edwards; No. 15, Negro Youth in a Cotton-Peanut County, Southampton County, Virginia, by S. J. Harris; No. 16, Youth Adjustments in a Rural Culture, Rockville Community, Hanover County, Virginia, by D. G. Jones; No. 17, Preliminary Findings of the Virginia Rural Youth Survey, by C. G. Burr and W. E. Garnett; No. 18, Discussion Guide for Youth Groups—Preliminary, by M. McD. Ward, C. G. Burr, and W. E. Garnett; and Conditions and Trends Calling for the Concerted Attention of All Forward Looking Citizens, by W. E. Garnett, A. D. Edwards, W. H. Roney, et al.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Life science, M. W. DE LAUBENFELS (*Author, [1941], pp. [IV]+320, figs. 1,022*).—"This book is intended for the general reader as well as a text for college students. It covers the material that the ordinary American citizen needs, as worked out by careful research during 11 yr., with the cooperation of nearly 3,000 students." Following the introductory material, the section headings are what is life? or the story of protoplasm; man, the representative; health for home and neighborhood; the natural history of vegetables; the natural history of animals; heredity and environment; and life through the ages.

Showmanship in the classroom, L. F. PAYNE. (Kans. State Col.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 94-96).—A discussion is presented of teaching methods that have proved successful in the poultry classroom.

The market-milk industry, C. L. ROADHOUSE and J. L. HENDERSON (*New York and London: McGraw-Hill Book Co., 1941, pp. XV+624, figs. 167*).—This text is planned for college students who have had some instruction or experience in dairying or the dairy industry. The several chapters deal with the history and development of the market-milk industry; the composition of milk and its physical and chemical properties; micro-organisms, enzymes, and cells of milk and cream; milk and the public health; safeguarding the milk supply; sanitary production of market milk; construction and arrangement of sanitary dairy-farm buildings; country milk-receiving stations; the transportation of milk; flavors of milk; construction and arrangement of the city milk plant; milk-plant operation; washing and sterilizing dairy equipment; pasteurization

of milk; mechanical refrigeration; the cooling of milk; the creaming of milk; table cream and whipping cream; special milk products; the distribution of milk; the cost of milk production; the price of milk and price plans; dairy inspection and market-milk control; the use of milk in nutrition; and the milk-plant laboratory and its operation. Each chapter is followed by references. Appendixes include problems in standardization of milk and cream, a table for use in computing logarithmic averages of bacterial counts, a table showing the International Association of Milk Dealers' depreciation rates of milk plants and equipment, and the U. S. Public Health Service milk ordinance.

The new home economics omnibus, F. L. HARRIS and H. H. HUSTON (*Boston: Little, Brown & Co., 1941, pp. XV+666, [pls. 25], figs. [275]*).—A revision of a previously noted text (E. S. R., 77, p. 127).

FOODS—HUMAN NUTRITION

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1941, pp 7-13*).—This annual report (E. S. R., 84, p. 836) summarizes the work of the Foods and Nutrition Division on vitamin A in nutrition, vitamin content of foods, and food selection and preparation.

[**Nutrition studies by the Alabama Station**] (*Alabama Sta. Rpt. 1940, pp. 23-25*).—Progress reports (E. S. R., 81, p. 140) are given on studies by W. D. Salmon on the relation of pyridoxin, pantothenic acid, and linoleic acid to the cure of rat acrodynia; by R. W. Engel on choline deficiency in young rats (E. S. R., 86, p. 420); by Engel on effect of calcium pantothenate and other B-vitamin factors on liver fat; and by W. C. Sherman on the comparative nutritive value of the protein of cowpeas and soybeans.

[**Studies on food preparation and utilization at the Colorado Station**] (*Colorado Sta. Rpt. 1941, pp. 26-29*).—This progress report (E. S. R., 84, p. 692) summarizes work previously noted and findings on the relative juice yield from cherries of U. S. No. 1 grade and slightly smaller fruits.

Symposium on "food resources of Hawaii" (*Pan-Pacific, 4 (1940), No. 4, pp. 3-12, figs. 4*).—This symposium, held under the auspices of the Hawaiian Academy of Science at its sixteenth annual meeting, included an introduction by A. L. Dean and the following papers: Hawaii's Food Supply, by H. H. Warner (pp. 4-5) (Univ. Hawaii); and Hawaii's Food Requirements Under Normal and Emergency Conditions, by M. Potgieter and C. D. Miller (pp. 6-9), and Beef and Dairy Resources in Hawaii, by L. A. Henke (pp. 10-12) (both Hawaii Expt. Sta.).

The analysis of Ceylon foodstuffs.—IX, A, **The composition of some Ceylon honeys**; B, **The nutritive value of some palmyra products**, A. W. R. JOACHIM and S. KANDIAH (*Trop. Agr. [Ceylon], 95 (1940), No. 6, pp. 339-343*).—These two studies are in continuation of the series noted earlier (E. S. R., 85, p. 570). The five honeys are described and data are reported for their content of moisture, sugars (total, sucrose, glucose, and fructose), and dextrin, and their acidity. Analytical data are presented for products of the palmyra palm, including the dried roots (raw and parboiled), palmyra jaggery, the dried fruit pulp, and the sweet and fermented palmyra sap.

Foods and drugs, E. R. TOBEY (*Maine Sta. Off. Insp. 179 (1941), pp. 131-261*).—This annual report (E. S. R., 84, p. 694) gives the results of analyses of official samples of foods and drugs. Data are reported on the caffeine content of coffee, tea, cocoa (all as beverages), chocolate sirup, and beverages of the cola type; on specific gravity, butterfat, solids-not-fat, total solids, sediment, and plate count of a great number of samples of milk; on butterfat and grade of many samples of cream; on free fatty acid, color, and results of cold test in pack-

ing oils for sardines; and on free liquid, and solids in the drained meats, of clams. Results of bacteriological examinations of utensils and results of analyses of a number of drugs are also reported.

Selenium in wheat and wheat products, H. W. LAKIN and H. G. BYERS. (U. S. D. A.). (*Cereal Chem.*, 18 (1941), No. 1, pp. 73-78).—This paper presents a résumé of the results of determinations of the selenium content of 951 samples of wheat and wheat products collected in portions of Colorado, Kansas, Nebraska, South Dakota, Wyoming, Montana, North Dakota, and Minnesota. The places of collection were in seleniferous areas, or in towns that might handle grain from such areas. Of these samples, 82.5 percent contained 1 p. p. m. or less, 10 percent contained 2-3 p. p. m., and 7.5 percent contained 4 p. p. m. or more of selenium. Only 8 samples contained as much as 10 p. p. m. or more. It is pointed out that little information is available as to the toxic limits for humans, but that there is evidence (E. S. R., 76, p. 375) that 4 p. p. m. would be toxic to animals if fed as the sole diet. Since the wheat from the areas examined constitutes but a minor portion of the wheat production of the States involved, since only 7.5 percent of the samples contained enough selenium to be toxic to white rats when fed as the sole diet, and since seleniferous wheat is greatly diluted when shipped to large milling centers, it is considered that seleniferous wheat probably constitutes no health hazard to people outside the seleniferous area. Selenium was found in all samples analyzed in the present study, as well as in all examined by W. O. Robinson.³ It is considered, therefore, that "the mere presence of selenium in wheat must not be viewed with alarm, since it is probably a normal constituent and becomes a problem only when it occurs in sufficient quantities to be injurious."

Note on the use of yeast to destroy glutathione in wheat-germ for bread-making, E. W. HULLETT (*New Zeal. Jour. Sci. and Technol.*, 22 (1940), No. 1B, pp. 44B-47B, figs. 2).—The adverse effects on dough and bread quality associated with the use of untreated wheat germ are avoided by preparing a "ferment" of the germ, yeast, and water and allowing this to stand for a number of hours, during which time fermentation takes place and the glutathione disappears. After the required time the ferment is mixed with flour, salt, sugar, and more water and made into a dough from which bread is made in the ordinary manner. Four percent of the treated germ (on a flour basis) gives a bread very similar to ordinary white bread. With 10 percent of germ, the crumb texture and volume are only slightly affected, but the crumb color is light brown. Biological tests indicate that vitamin B₁ survives the process. High extraction flour treated like the wheat germ gives satisfactory results in a process involving the use of 16 gm. of the low-grade flour and 2.5 gm. of yeast in the sponge which is allowed to stand for 3 hr.; 109 gm. of 70-percent extraction flour and the usual amount of sugar are then added to the ferment and the resulting dough fermented for a further 3 hr. and then baked. The loaf has a somewhat grayish crumb color, but in other respects is not seriously inferior to a loaf made from a 70-percent extraction flour by a straight-dough process. The success of the method suggests that glutathione elimination may be an important part of the dough-ripening process. Practically, the method affords a means of raising the vitamin B₁ content of bread.

The addition of homogenized vegetables to the diet of the young infant, M. L. BLATT, H. M. JACOBS, J. B. MURPHY, and M. ZELDES (*Arch. Ped.*, 58 (1941), No. 1, pp. 40-47, figs. 4).—On the thesis that a broad iron-containing diet seems indicated as a routine in infant feeding to supplement the iron deficiency of milk, a study was made of the response of infants from 1 to 6 mo. of age to

³ *Indus. and Engin. Chem.*, 28 (1936), No. 6, pp. 736-738, fig. 1.

the addition of a homogenized vegetable mixture to the basic formula. This mixture upon analysis showed an average of 31 mg. of calcium, 54 of phosphorus, 1.58 of iron, and 0.15 mg. of copper per 100 gm. Sixty-four infants, 23 of whom were observed for 4 mo., were started with 1 or 2 teaspoonfuls of the homogenized vegetables. Those started at from 5 to 6 mo. were given 1 tablespoonful. The amounts were increased by 1 or 2 teaspoonfuls every second week until 3 or 4 tablespoonfuls were being given. Hemoglobin curves paralleled the normal in contour except that the lowest drop in hemoglobin came between the eighteenth and twenty-fourth weeks rather than at the twelfth week as is normal. From this point the trend was upward, surpassing the normal average within a few weeks. The erythrocyte curves also paralleled the normal, although the counts were lower than normal values. The birth weight was doubled at 4½ mo. in the group started on the homogenized vegetables at from 1 to 2 mo. and at 4¾ mo. in the group started at from 2 to 3 mo. The height increase was correspondingly rapid, the vegetables were well tolerated, produced no diarrhea, and were apparently well digested, since few vegetable fibers were seen in the stools and those only after prolonged and diligent search.

Polyphenolase activity as a primary cause in darkening of boiled potatoes. W. E. TOTTINGHAM and C. O. CLAGETT. (Wis. Expt. Sta.). (*Science*, 94 (1941), No. 2447, p. 497).—Following the finding that a compound reacting like catechol was associated with the blackening of potatoes after boiling (E. S. R., 85, p. 692), the polyphenolase system was investigated and found to be associated with the blackening tendency.

Composition of fireweed honey. J. A. ELLEGOOD and L. FISCHER (*Food Res.*, 5 (1940), No. 6, pp. 559-561).—Four samples of fireweed (*Epilobium angustifolium*) honey, obtained from the State of Washington, are described as to origin, and results of analyses by A. O. A. C. methods are presented. Direct and indirect polarization at 20° and 87° C., water, invert sugar, sucrose, ash, dextrin, and free acid as formic are reported.

Fruit products which the farmer can make. D. K. TRESSLER (*Farm Res.*, [New York State Sta.], 8 (1942), No. 1, pp. 13, 14, 15).—This article indicates briefly the possibilities of some of the more important fruit products, and outlines the general nature of their manufacture. For details as to the preparation of frozen fruits, fruit juices, glace fruits, and other fruit products, the reader is referred to station and other publications, most of which have been noted previously (E. S. R., 76, p. 297; 79, pp. 563, 583; 81, p. 449; 83, p. 701).

Dried citrus fruits for marmalade. W. V. CRUICKSHANK and J. SUGIHARA. (Univ. Calif.). (*Canner*, 94 (1941), No. 4, pp. 11-12, fig. 1).—Sliced citrus fruits were successfully dried to give a product satisfactory for making marmalade. In the case of oranges the lightly sulfured fruit gave the more satisfactory product from the standpoint of color, and the flavor of the fruit was not adversely affected. For each pound of dried product, 6.7, 6.5, and 4.7 lb. of raw sliced grapefruit, lemon, and orange, respectively, were required. Each pound of dried fruit, used in the proportion of 30 parts of orange, 10 of lemon, and 10 of grapefruit by weight, yielded 19 and 13 lb., respectively, of the pulpy and golden shred types of commercial marmalade.

Nutritive properties of steam-rendered lard and hydrogenated cottonseed oil. R. HOAGLAND and G. G. SNIDER. (U. S. D. A.). (*Jour. Nutr.*, 22 (1941), No. 1, pp. 65-76).—The results of the present experiments, confirming those of a previous study (E. S. R., 83, p. 269), indicated that steam-rendered lard and hydrogenated cottonseed oil had about the same growth-promoting value for rats when fed at 5-percent levels, but that lard was somewhat supe-

rior at higher levels. "Both lard and hydrogenated cottonseed oil induced maximum growth when the diets contained 30 percent, and minimum growth when the diets contained 5 percent, of fat. Each fat was utilized least efficiently for growth when the diet contained 5 percent of fat, but each was utilized with approximately equal efficiency whether the diet contained 15, 30, or 54 percent of fat. Lard was superior in digestibility to hydrogenated cottonseed oil at each level of fat intake. The digestive coefficients for lard ranged from 95.9 to 97.4 percent with an average of 96.4 percent, whereas those for hydrogenated cottonseed oil ranged from 91.0 to 95 percent with an average of 92.9 percent."

Wrapping meat for frozen storage, L. H. BLAKESLEE (*Michigan Sta. Quart. Bul.*, 24 (1941), No. 2, pp. 111-113, fig. 1).—This brief discussion concerning satisfactory materials and methods for wrapping meat for frozen storage is based upon studies in part noted earlier (E. S. R., 83, p. 560).

Mechanisms of biological oxidations, D. E. GREEN (*Cambridge, Eng.: Univ. Press*, 1940, pp. [7]+181, figs. 22).—This book deals first with the general properties of oxidation enzymes and then considers the nature and mechanism of action of specific enzymes acting as catalysts in intracellular oxidation reactions. The several chapters deal with Fe porphyrin protein enzymes, pyridinoprotein enzymes, flavoprotein enzymes, Cu protein enzymes (with an addendum on a Zn protein enzyme), thiaminoprotein enzymes, cytochrome-reducing dehydrogenases, unclassified oxidation enzymes, and oxidations in organized systems.

The growth curve of the albino rat in relation to diet, T. F. ZUCKER, L. HALL, M. YOUNG, and L. ZUCKER (*Jour. Nutr.*, 22 (1941), No. 2, pp. 123-138, figs. 4).—Data on the mean weights at successive age intervals of male and female rats in the breeding colonies of several laboratories (including the authors') were analyzed to answer the question "What is normal or optimal growth or what should be the course of growth in the rat strain employed, when there are no deficiencies?" The analyses showed that rats on present-day stock diets grow at a progressively decreasing rate after weaning. Growth curves, with the point of inflection in the preweaning period and with a constantly decreasing slope in the postweaning period, are greatly simplified as compared with those based on early data and seem to justify the attempt to convert them to a straight-line function of time and weight. In the equation developed the logarithm of the weight is plotted against the reciprocal of the time, according to the formula $\log W = \frac{-k}{t} + \log A$, where W is the weight at time t , A is the

weight approached asymptotically in the adult animal, and k is the slope of the line which characterizes the rate of growth $\left(k = \frac{\log W_2 - \log W_1}{1/t_1 - 1/t_2}\right)$.

"Neither natural variation in size of the animal nor artificial stimulation of growth rate causes a deviation from the empirical formula of growth. While inherent size of rats varies considerably, the slope of the plot (k of the formula) varies but little for each sex in albino rats. In all cases where data for males and females are available, the ratio of k for males and k for females is constant within 3 percent. Deviations on diets suboptimal for growth are discussed."

Growth and calcification on a diet deficient in phosphate but otherwise adequate, T. F. ZUCKER, L. HALL, and M. YOUNG (*Jour. Nutr.*, 22 (1941), No. 2, pp. 139-151, figs. 4).—A rachitogenic diet, No. 803, composed of starch 65 percent, cottonseed flour 20, casein 6, egg albumen 3, NaCl 1, cottonseed oil containing carotene 2 (furnishing 750 units of vitamin A per 100 gm. of diet), and CaCO₃ 3 percent, was found to be comparable to the rachitogenic diet No. 2965 of Steenbock and Black with regard to rickets-producing quality, as

judged by the percentage of ash in the dry fat-free femur and the width of the uncalcified cartilage of the tibia. Diet No. 803, containing 0.28 percent of phosphorus, 52 percent of which is in the form of phytin, is deficient only in phosphorus, since the addition of phosphate (2 percent KH_2PO_4) permitted normal growth as interpreted from the curve obtained by plotting the log of the weight against the reciprocal of time (see above abstract). The addition of vitamin D to this (or to other low-phosphorus rickets-producing diets) prevented anatomical signs of rickets, but did not lead to normal growth or to bone ash values equal to those of stock-diet animals of the same age or of the same weight; phosphate addition was required to bring the composition to normal. "It is pointed out that the visual signs of rickets do not necessarily correspond to bone composition, and the differences between the experimental rickets of rats and the spontaneous rickets in other species are discussed."

Effect of gelatine feeding upon the strength and fatigability of rats' skeletal muscle, G. C. KNOWLTON (*Amer. Jour. Physiol.*, 131 (1940), No. 2, pp. 426-427).—It is pointed out that the studies by Ray et al. and by Hellebrandt et al. (E. S. R., 84, p. 843) employed subjective criteria as to the point of fatigue, and that such criteria, while valid for measurements of fatigue as a psychic reaction, did not necessarily reflect the functional capacity of the muscle. The present experiments to determine the effect of gelatin upon the functional ability of muscle in rats were designed, therefore, to measure fatigability by objective tests. The procedure used involved exposure of the gastrocnemius muscle in anesthetized rats, attachment of the severed tendon to a torsion rod, and rigid fixing of the femur, followed by stimulation of the muscle with maximal induction shocks. The response of the muscle was magnified with an optical lever and recorded on film. When the tension returned to the base line the muscle was removed and analyzed for creatine. The tension curves were measured for maximum strength, for the time required for the response to fall to 10 percent of the maximum, and for the area under the curve to 10 percent of maximum strength. Comparison of the response of rats receiving by stomach tube for a week prior to the test a daily gelatin supplement of 0.5 gm. in 3 cc. of water with the response of rats receiving a similar glucose supplement indicated that the feeding of the gelatin supplements to the adult male rat leads to no changes in the muscle itself which enhance functional performance.

Hemoglobin and plasma protein: Simultaneous production during continued bleeding as influenced by diet protein and other factors, F. S. ROBSCHT-ROBBINS, S. C. MADDEN, A. P. ROWE, A. P. TURNER, and G. H. WHIPPLE (*Jour. Expt. Med.*, 72 (1940), No. 5, pp. 479-497).—Clinical experimental histories and data on protein intake and output are given for healthy dogs observed for their capacity to produce new hemoglobin and plasma protein while fed abundant iron and a limited protein diet under a condition of sustained anemia due to simple bleeding. The dogs varied in their response, some producing much hemoglobin and enough plasma protein to maintain a low normal plasma protein level, while others producing the same amount of hemoglobin developed a hypoproteinemia which continued; the ratio of plasma protein to hemoglobin varied from about 60 to 80 percent in the former group and from about 40 to 60 percent in the latter. In some dogs the total new formed blood protein amounted to about 30-40 percent of the total diet protein, indicating a remarkable capacity to conserve and use diet protein. With the simultaneous depletion of hemoglobin and plasma protein levels, the dogs were observed in all cases to give preference to hemoglobin manufacture regardless of the type of protein fed (liver, salmon, soybean, beef, casein, and amino acid supplements in some cases).

Effect of intramuscular injection of sodium citrate on the prothrombin time of the blood. B. G. P. SHAFIROFF, H. DOUBILET, and C. TUI (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 136-139).—Six normal dogs varying in weight from 9 to 17 kg. received intramuscular injections of sodium citrate, the amounts injected (in 50 cc. of hypertonic solution) varying from 1.50 to 8.50 gm. and averaging 0.125 and 0.50 gm. per kilogram. In blood samples drawn just prior to injection, the prothrombin times average 11.8 sec. Thirty min. after the injection the average fall in prothrombin time was 17 percent, and by the end of 90 min. there was a 24 percent reduction. In one dog the prothrombin time was reduced 50 percent at the end of 1 hr. Coagulation time determined by the method of Lee and White was lowered within 60 min. to 48 percent of its original value; this decrease was paralleled by the reductions in calcium coagulation time and capillary coagulation time. Hematocrit estimations showed no characteristic variations. The characteristic fall in coagulation and prothrombin times invariably observed in the animals injected with sodium citrate were not observed in two normal dogs used as controls or in three other control dogs, two of which received NaCl (0.50 and 0.64 gm. per kilogram) and one of which received KCl (0.50 gm. per kilogram) injections. Hematocrit determinations on the several controls showed no characteristic variations.

Calcification and ossification: Calcification in normal growing bone. F. C. McLEAN and W. BLOOM (*Anat. Rec.*, 78 (1940), No. 3, pp. 333-359, pls. 3).—This introductory paper of the series describes the improved histological method by which many of the findings were obtained, and presents considerations fundamental to the series of experiments. The histological method involves positive staining of bone salts by impregnation with silver, counterstaining of cellular elements with hematoxylin and eosin, and the preparation of thin serial sections of the undecalcified bone embedded in hard nitrocellulose.

Calcification in the cartilage matrix is described. Analysis of the process indicates that this matrix has calcifiability conferred upon it when the adjacent cartilage cells reach a certain stage of development. The relationship of calcification to intracartilaginous ossification is discussed. The studies on rats, puppies, and kittens indicate that bone matrix in these animals is calcifiable when laid down, so that under optimum conditions of supply and transport of bone materials the matrix is usually calcified simultaneously with its deposition or so soon thereafter that no intermediate stage of uncalcified osteoid tissue is demonstrable. The center of ossification in the patellar tendon, later forming the anterior tubercle of the tibia; the calcification of the bone formed by ossification of the patellar tendon at its junction with the shaft of the tibia; and the insertion of the crucial ligaments in the tibia and femur are described. "Resorption of normal bone involves bone salt and organic matrix simultaneously. No evidence for the phagocytosis of bone salts by osteoclasts has been found."

The metabolic behaviour of phosphorus.—III, Balance sheets of phosphorus in full-grown rats fed with tri-stearine and sodium inositol hexaphosphate. A. WESTERLUND (*Lantbr. Högsk. Ann. [Uppsala]*, 8 (1940), pp. 209-232, figs. 5; *Swed. abs.*, pp. 231-232).—In the present study, in continuation of the series (E. S. R., 83, p. 704), sodium inositol hexaphosphate was substituted for sodium phosphate as the source of phosphorus used to supplement the low-phosphorus diet fed to adult male rats for a 10-day experimental period. Intake and excretion of calcium and phosphorus were measured in the last 6 days of this period. The urinary excretion of phosphorus depended chiefly upon intake and to a considerably less extent upon fecal elimination, while the latter in turn was determined by the corresponding fecal elimination of cal-

cium and the consumption of phosphorus. The relation between intake and fecal excretion of phosphorus was of borderline significance, however, while that between calcium excretion and phosphorus excretion was clearly significant, indicating that heavy ingestion of calcium impairs the absorption of inositol phosphorus and vice versa. The urinary excretion of calcium, which amounted to no more than 3 percent of the total excretion, bore no relation to any of the concomitant variables. The fecal excretion of calcium was determined to a moderate extent by the corresponding ingestion of phosphorus, an increase in phosphorus consumption being followed by a slight decrease in fecal elimination of calcium, and also by the fecal excretion of phosphorus. No relation could be demonstrated between calcium consumption and fecal excretion of calcium. The results of the present investigation are considered to provide no basis for the opinion that inositol phosphorus should be less available for intestinal absorption than that from $(\text{NH}_4)_2\text{HPO}_4$ or $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$, compounds previously studied.

Rise in serum copper following oral administration of copper sulfate, A. SACHS, V. E. LEVINE, A. SCHMIT, and R. HUGHES (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 192-193, fig. 1).—Dogs maintained at constant weight were fasted for 18 hr., following which the basal copper level in the serum was determined hourly for 7 hr. The fasting serum copper values remained fairly constant. At the end of another 18-hr. fast, another serum sample was collected and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, at the rate of 2, 8, or 16 mg. per kilogram and dissolved in 400 cc. of water, was administered by stomach tube. Serum samples collected $\frac{1}{2}$ hr. later and then hourly for 5 hr. were analyzed for copper content. Curves showing serum copper in milligrams percent in relation to time indicate that the feeding of varying amounts of copper sulfate definitely raised the serum copper above the basal level, the larger doses producing a more sustained rise than the smaller doses. At 8 mg. per kilogram the dogs retained the $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ very well, but doses as large as 16 mg. per kilogram usually caused emesis.

The response of blood donors to iron, A. C. SANTY (*Amer. Jour. Med. Sci.*, 201 (1941), No. 6, pp. 790-796, figs. 3).—The hemoglobin response of 27 active professional blood donors was studied under therapy with iron (four 3-gr. tablets of exsiccated ferrous sulfate daily) and without medication. There was regularly a depression of hemoglobin immediately after donations. With the addition of iron following a 500-cc. donation, there was a return to the previous hemoglobin level in an average of 11 days, this regeneration occurring about eight times more rapidly than when iron was withheld. "A rough calculation of the amount of hemoglobin in the total circulation revealed the fact that the average active donor in this series could not maintain a positive balance without iron medication. It was found that the response to iron usually continued after its withdrawal, indicating that the most effective time to administer iron is before blood loss. It is concluded that the diet of regular donors should be supplemented with iron. Ferrous sulfate, because of its convenience and freedom from reactions, was regarded as a very satisfactory form of iron for blood donors."

Studies in tooth development: The growth pattern of human teeth, I, II, I. SCHOUR and M. MASSLER (*Jour. Amer. Dent. Assoc.*, 27 (1940), Nos. 11, pp. 1778-1793, figs. 9; 12, pp. 1918-1931, figs. 10).—The growth of enamel and dentin is traced and analyzed according to the stages of (1) initiation, (2) proliferation, (3) histodifferentiation, and (4) apposition. This latter stage is discussed in detail in terms of (a) the pattern of cellular activity and (b) the pattern resulting from the apposition of daily increments of enamel and dentin.

The approach, as indicated, is histophysiologic rather than histologic, and emphasis is given, therefore, to the general form or pattern of the developing tooth rather than its histologic structure, and to cellular dynamics rather than cytologic details. It is pointed out that the incremental lines of growth, giving rise to a tooth-ring picture similar to that of tree rings, are the result of a daily physiologic rhythm in cellular activity. Variations from the normal rhythm during growth are reflected in the tooth ring pattern. The time of the effect can be dated by the chronological position of the affected incremental layer, while the intensity of the condition is reflected in the degree to which this affected layer is deficient in growth or calcification. For the most part the cause of the effect is not recorded in the dental tissue, although the response to certain conditions, such as rickets or fluorosis, is often a characteristic syndrome or composite.

Vitamin A supplies during a national emergency, K. HICKMAN and G. C. MEES (*News Ed. (Amer. Chem. Soc.)*, 19 (1941), No. 11, pp. 623-625, figs. 2).—This survey, based on the rough generalization that half the population requires a vitamin A supplement of half the minimum daily requirement (requirement considered as 3,500 units per person) for half the year, estimates a minimum supplemental requirement of 22.4 trillion units per year for the whole United States. Data available on production of vitamin A oils (1939-41) and their use for medicinal, poultry feeding, and industrial purposes indicate that current supplies of vitamin A in the United States are more than sufficient for a minimum level of medication for the whole population. It is pointed out that future supplies can be increased by extracting the vitamin from those oils which now pass to industrial use, and, if necessary, that supplies can be spread further by wise distribution of dosage.

The vitamin A values of 128 foods as determined by the rat-growth method, L. E. BOOHER and R. L. MARSH (*U. S. Dept. Agr., Tech. Bul. 802* (1941), pp. 30, fig. 1).—According to an abstract by the authors, "the vitamin A content of a representative collection of 128 of the more common foods, determined by the rat-growth method, is reported in this bulletin. A brief review of the chemical and physical nature of the known vitamin A-active compounds and the available methods for the measurement of vitamin A activity are included. A detailed description of the method used in this study is presented."

Teneur en vitamine A du sang des donneurs du centre de la transfusion de Paris [Content of vitamin A in the blood of donors at the Paris transfusion center], A. CHEVALLIER and M. SUREAU (*Compt. Rend. Soc. Biol. [Paris]*, 134 (1940), No. 7, pp. 387-389).—A group of 30 apparently healthy universal blood donors gave vitamin A blood serum values, determined spectrophotometrically, ranging from 5 to 68 μg . per 100 gm. With values between 40 and 50 μg . per 100 gm. considered as normal, between 30 and 40 as sub-clinical, and below 30 μg . per 100 gm. as indicating definite vitamin A deficiency, 40 percent of the subjects could be considered as normal, 37 as sub-clinical, and 23 percent as definitely deficient in vitamin A. The vitamin (dosage not stated) was then administered daily for 10 days, and after a further 10-day period blood values were again determined, with a resulting range of from 16 to 100 μg . per 100 gm. In 22 cases the values were higher than before vitamin A treatment, in 6 cases the same, and in 7 lower (attributed to faulty assimilation).

The importance of liberal intakes of vitamin A by blood donors is emphasized.

Effect of administration of thyroid extract and of α -dinitrophenol upon dark adaptation, A. J. PATEK, JR., and C. HAIG (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 180-182).—In this preliminary report evidence is sum-

marized indicating that the oral administration of thyroid extract or α -dinitrophenol increases the speed of dark adaptation and lowers the visual threshold in subjects with prolonged dark adaptation. In four of five experiments serum vitamin A levels were lowered by the therapy. In the fifth a rise in serum vitamin A and a striking reduction in serum carotenoids from an abnormally high to a normal level occurred. The fact that both forms of therapy produced the same result suggested that the visual changes were functions of general metabolism, but in two of the subjects the maximal visual effects occurred before changes in the basal metabolic rate were evident, and in the other there was no correlation between the basal metabolic rate and the speed or extent of dark adaptation. The improvement in dark adaptation was greater in the rods than in the cones, the response thus resembling that in vitamin A therapy. "The decrease in serum vitamin A level accompanying the improvement in dark adaptation suggests that the feeding of thyroid extract or of α -dinitrophenol to these patients facilitated the utilization of vitamin A by the visual mechanism."

Vitamin B₁ (thiamine hydrochloride) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+31*).—A supplement, dated November 1941, to the previously noted bibliography (E. S. R., 86, p. 423).

Vitamin B₁ in vertebrate muscle, M. PYKE (*Biochem. Jour., 34 (1940), No. 10-11, pp. 1341-1347, fig. 1*).—The vitamin B₁ contents of various muscles were determined in a number of domestic and experimental animals and specimens from the zoo. The thiochrome method, as modified by the author (E. S. R., 85, p. 701), was used. The muscles of the pig were several times richer in vitamin B₁ than those of any other animal. The normal variation of vitamin B₁ in pig muscle ranged from 170 to 510 International Units per 100 gm., as determined on random pigs obtained from bacon factories. Variations also occurred in the amount of vitamin B₁ in different muscles in any one animal. In the pig the psoas muscle was found to contain from 200 to 485 I. U. per 100 gm., while the longissimus dorsi contained from 160 to 340 I. U. per 100 gm. In the kid a range of from 4 to 63 and in the horse from 4 to 6 I. U. per 100 gm. was obtained in the various muscles analyzed. Heart muscle from various animals contained from 70 to 170 I. U. per 100 gm. The concentration of vitamin B₁ was higher in the ventricles than in the auricles. Red muscles of rabbits appeared to contain more vitamin B₁ than the white muscles, the range in values being from 12 to 63 and from 10 to 36 I. U. per 100 gm., respectively. In muscle allowed to stand after death there was apparently a breaking down of cocarboxylase, free vitamin B₁ appearing in such pig muscle, while vitamin B₁-monophosphate apparently formed in horse heart.

A preliminary survey of the vitamin B₁ content of American cereals, A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Cereal Chem., 18 (1941), No. 1, pp. 106-113*).—The vitamin B₁ content, determined by the method of the authors (E. S. R., 83, p. 417) and expressed as gamma per gram, varied from 4.2 to 7.3 in 31 samples of wheat, from 3.8 to 9.2 in 37 of barley, from 4.1 to 8.0 in 23 of corn, from 4.8 to 10.3 in 21 of oats, from 4.0 to 5.7 in 10 of rye, from 4.2 to 8.5 in 5 of buckwheat, and from 6.0 to 8.2 in 3 samples of millet. The results presented are considered only preliminary but sufficient to indicate that "there are significant differences in the thiamin content of various strains of the same cereal, and there are indications that regional differences may affect the thiamin content of a single strain. In view of the spread in values which is observed in most of the cereals it is not possible to evaluate a diet or food mixture containing cereals without analysis of the ingredients."

The thiamin content of whole-wheat and clear flours, C. HOFFMAN, T. R. SCHWEITZER, and G. DALBY (*Cereal Chem., 17 (1940), No. 6, pp. 733-736, fig. 1*).—

Data taken from continuous routine assays, including many made on flours actually used in production, are reported for flours analyzed for ash and for thiamin content as determined by the fermentation method of Schultz et al. (E. S. R., 79, p. 11). Forty-six whole-wheat flours, including 24 special samples from known regions and 22 samples from commercial shipments, varied from 5.0 γ to 8.7 γ , and averaged 6.85 γ of thiamin per gram on the 10 percent moisture basis. "There was no correlation with ash content and no special trend toward high or low vitamin contents in various parts of the wheat-producing areas except that the white or softer type of wheat tended to be somewhat lower than the average." The thiamin content of 18 clear flours varied from 2.0 γ to 4.7 γ per gram, and showed a definite relation to the ash content.

Thiamin deficiency in relation to wheat flour, A. W. ALCOCK (*Canad. Chem. and Process Indus.*, 25 (1941), No. 1, pp. 3-7).—This discussion of general problems involved in the fortification of white flour with synthetic thiamin voices certain objections to the requirement of the British Ministry of Food for the addition of 0.2 gm. of thiamin per 280 lb. of flour (0.82 International Unit per gram). One objection is that at Canadian prices this would be an expensive ingredient, and another is that the addition of thiamin alone does not make good the loss of minerals and other vitamins sustained in the milling process. Enrichment with high vitamin yeast and with wheat germ and the use of long extraction rather than short patent flours are discussed pro and con as alternate methods of increasing the thiamin content of wheat products.

The loss of thiamin in bread on baking and toasting, C. HOFFMAN, T. R. SCHWEITZER, and G. DALBY (*Cereal Chem.*, 17 (1940), No. 6, pp. 737-739).—The thiamin content of the caramelized part of the crust, the half inch of the slice immediately under the crust, and the interior of the slice (1 sq. in.), and the entire slice was determined in three types of bread by the fermentation procedure of Schultz et al. (E. S. R., 79, p. 11). These several portions, respectively, averaged 1.0 γ , 1.2 γ , 1.2 γ , and 1.1 γ per gram (dry basis) in regular white bread; 6.9 γ , 8.7 γ , 10.8 γ , and 10.2 γ per gram in high vitamin B₁ bread; and 5.3 γ , 6.7 γ , 7.5 γ , and 6.8 γ per gram in whole-wheat bread. Baking loss, calculated as the percentage difference between the thiamin content of the interior of the slice and the average of the entire slice, amounted to 8, 5, and 9 percent in the three types of bread, respectively. Regular white, two samples of high vitamin B₁ white, and whole-wheat breads having thiamin contents of 1.0 γ , 4.9 γ , 12.3 γ , and 6.7 γ per gram (dry basis), respectively, showed losses of 0, 4, 12, and 0 percent, respectively, with light toasting; 0, 10, 17, and 3 percent with medium toasting, and 0, 24, 21, and 12 percent with heavy toasting.

The baker's "A B C" on bread enrichment (*Southwest. Miller*, 19 (1941), No. 51, pp. 19-20).—This general outline of the A B C's of the "enriched" bread program for the baking industry, prepared by the American Bakers' Association, gives information concerning the required ingredients for enriched bread and the methods that may be pursued for its production, and comments briefly on costs, legal standards ultimately to be fixed, and advantages.

Bakers' viewpoints on vitamins in bread, J. A. TOBEY (*Southwest. Miller*, 19 (1941), No. 48, pp. 19, 38).—Referring to "enriched" bread, the author points out the several propositions the baker must consider in deciding to produce this special vitamin bread. Effective methods of making the vitamin additions and the cost of these added components (probably only a fraction of a cent per pound loaf), labor involved, promotion needed, and the likelihood of a local demand for such bread are the chief items considered.

Vitamin-rich baked products, R. E. CARR (*Michigan Sta. Cir.* 178 (1941), pp. 15).—Recipes are given for breads, cakes, and cookies made with the addi-

tion of dry brewers' yeast (not the yeast ordinarily used in bread making) or wheat germ as ingredients to increase the amount of the vitamin B complex in the baked products. It is pointed out that the use of brewers' yeast modifies the texture of the baked product unless the batters and doughs are baked immediately after the yeast has been added, and that the flavor, which is objectionable to some individuals, should be masked through the use of molasses, honey, or spices. The use of wheat-germ flakes produces baked products of coarser texture than is otherwise obtained, but the danger of weakening the structure is lessened if the flakes are added at the very last of the mixing.

The activation of cocarboxylase by thiamine, M. A. LIFTON and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 136 (1940), No. 3, pp. 637-651, figs. 3).—Decarboxylation of pyruvic acid by yeast carboxylase does not occur with yeast washed with alkaline phosphate buffer, but addition of cocarboxylase (thiamin pyrophosphate) and manganese or magnesium restores activity. The effect is considered specific for cocarboxylase, since neither thiamin nor thiamin monophosphate activates the carboxylase. Studies are described which show, however, that the cocarboxylase itself is strongly activated by thiamin in systems employing bakers' yeast, whereas only very minor activation occurs in systems employing brewers' yeast. "The mechanism of thiamin activation of cocarboxylase has been investigated. It is suggested that there is a heat-labile material present in bakers' yeast which can adsorb cocarboxylase without the production of an active enzyme. The addition of excess thiamin saturates this material and thus permits the adsorption of the cocarboxylase upon the active apoenzyme."

The estimation of vitamin B₁ in urine, M. JOWETT (*Biochem. Jour.*, 34 (1940), No. 10-11, pp. 1348-1355, fig. 1).—In the modified thiochrome method described, the blank fluorescence is said to be lowered considerably by the use of (1) a synthetic zeolite Decalco in place of activated earths and (2) of a considerable excess of the ferricyanide solution. Two types of blanks are distinguished—a reagent blank determined in the absence of urine and the urine blank representing the difference between the reagent blank and the total blank. In practice a value midway between the total blank and reagent blank is used in the calculations. Color readings are made with the Pulfrich photometer. The method is considered unsuitable for estimating low dietary excretions, but is suitable for measuring the response to test doses.

Data obtained with the modified method "support the view that maximum excretion occurs soon after the passage of most of the vitamin into the intestine, and that the variability of the lag between ingestion and maximum excretion is due to variability in the rate of emptying of the stomach."

Determination of vitamin B₁ requirement of infants by means of urinary excretion of thiamin, E. M. KNOTT (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 3, pp. 765-766, fig. 1).—Evidence on the vitamin B₁ requirement of infants is summarized from a series of 5-day balance studies on 12 healthy male infants during the first 6 mo. of life in which the vitamin B₁ intake was controlled at values from 21 to 313 units [International] through the amount and type of milk fed or by the addition of thiamin to the formula.

Only small quantities of the vitamin were excreted in the stools and with intakes up to 80 units only a small fairly constant amount in the urine. Beyond this point urinary excretion increased more or less regularly with intake up to 140 units, when much larger amounts were excreted. From these findings it is suggested that 80 and 140 units may represent the minimum and maximum quantities of thiamin needed by infants of this age, with a range of from 100 to 150 units representing the optimum intake.

Determinations over a period of 9 weeks of the cocarboxylase content of the blood of two infants on increasing amounts of thiamin showed that with one of the subjects from 42 to 56 units were not sufficient to maintain the cocarboxylase level, while the other subject did maintain the level on an intake of from 49 to 58 units. These data point to 60 units as barely sufficient and substantiate the conclusion based on the urine excretion that 80 units represent the minimum requirement.

Assessment of the level of nutrition: Urinary excretion of aneurin at varying levels of intake, Y. L. WANG and J. YUDKIN (*Biochem. Jour.*, 34 (1940), No. 3, pp. 343-352, figs. 4).—The daily outputs of aneurin (thiamin) of three healthy male subjects over a wide range of intake were determined by the thiochrome method following the technic of Wang and Harris (*E. S. R.*, 83, p. 851); a special study (using four subjects) was made of the level of excretion with an intake corresponding to the reputed requirement (300 International Units or 900 $\mu\text{g.}$); and finally the effects on thiamin excretion of exercise and of variations in the proportions of fat and carbohydrate in the diet were studied on three subjects.

On the basal diet furnishing from 100 to 150 $\mu\text{g.}$ of thiamin the excretion value fell rapidly, reaching fairly constant low levels in 5 or 6 days. With increased intakes the excretion rose only slightly until the intake reached 1,200 $\mu\text{g.}$, at which there was a sharp increase in excretion. The average daily excretion for 7 days on an intake of 900 $\mu\text{g.}$ ranged from 137 to 235 $\mu\text{g.}$ From curves of intakes plotted against excretion it was estimated that from 50 to 80 $\mu\text{g.}$ of thiamin would be excreted daily on a diet completely free from the vitamin. Additional carbohydrate in the diet in the form of 100 gm. of glucose for 1 day and 200 gm. daily for a further 4 days and exercise amounting to an equivalent of approximately 500 calories daily for 2 days caused a slight decrease, and an increase in the fat content of the diet by 200 gm. added for 4 days a less definite decrease in the thiamin excretion.

Verhalten des Aneurins und des Pyrophosphorsäuren aneurins (Cocarboxylase) im Blute bei der B₁-Vitaminbelastung [Behavior of aneurin and aneurin pyrophosphate (cocarboxylase) in the blood in vitamin B₁ saturation tests], S. MOLNÁR and M. HORÁNYI (*Klin. Wchnschr.*, 19 (1940), No. 45, pp. 1165-1167).—In an extension of earlier noted studies (*E. S. R.*, 84, p. 704) evidence was obtained that increases in the vitamin B₁ content of the blood and urine following test doses furnish a more satisfactory index of vitamin B₁ status than similar blood cocarboxylase values.

Further experiments on nutritional achromotrichia in rats and mice, P. GYÖRGY and C. E. POLING (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 3, pp. 773-776).—From data obtained in a repetition of earlier experiments on nutritional achromotrichia in rats (*E. S. R.*, 85, p. 134) and an extension of the work to black mice, the authors conclude that "pantothenic acid is only one, although probably the most important, factor in the prevention of nutritional achromotrichia as it is seen in rats and mice used in experiments in the vitamin B₂ complex. Biotin is an additional factor that is connected with the maintenance of the normal pigment metabolism of the fur in rats and mice under special dietary conditions."

p-Aminobenzoic acid, a vitamin, S. ANSBACHER (*Science*, 93 (1941), No. 2407, pp. 164-165).—Data are summarized demonstrating the cure of nutritional achromotrichia in rats by the daily administration of 1 cc. of a 20-percent ethanol solution containing 3 mg. per liter of p-aminobenzoic acid. Likewise, chicks on the vitamin K-deficient ration previously described (*E. S. R.*, 85, p. 714), supplemented with calcium pantothenate and the vitamin K-active 2-methyl-1,4-

naphthoquinone, grew better and had longer survival periods when the ration was supplemented with *p*-aminobenzoic acid in spite of severe dermatitis symptoms similar to the ones described by Hegsted et al. (E. S. R., 84, p. 803). From these findings it is concluded that *p*-aminobenzoic acid is one of the factors of the vitamin B complex.

Confirmatory evidence of the chromotrichial activity of *p*-aminobenzoic acid, G. J. MARTIN and S. ANSBACHER (*Jour. Biol. Chem.*, 138 (1941), No. 1, p. 441).—It is noted briefly that *p*-aminobenzoic acid has proved effective in darkening the fur of mice in which graying had been produced on the McCollum stock diet with hydroquinone added in amounts of 100 mg. per kilogram. This is thought to afford further evidence that *p*-aminobenzoic acid is a chromotrichia factor and that hydroquinone achromotrichia is a vitamin deficiency.

Inefficacy of pantothenic acid against the graying of fur, R. R. WILLIAMS (*Science*, 92 (1940), No. 2398, pp. 561-562).—Evidence from three series of tests on rats is reported, indicating that, contrary to the findings of György and Poling (E. S. R., 85, p. 134), neither pantothenic acid concentrate nor pure pantothenic acid is capable of preventing or curing achromotrichia in rats on a diet furnishing all of the other known components of the B complex. The principal difference between the diets used by the author and by György and Poling is that in the former 2 percent of corn oil is used instead of 8 percent of butterfat, as in the latter. It is suggested that this difference might result in significantly different amounts of the factor described by Nielson, Oleson, and Elvehjem (E. S. R., 83, p. 382).

Growth and graying of rats with total "filtrate factor" and with pantothenic acid, G. A. EMERSON and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 655-658).—Hooded or solid-colored male rats were placed at weaning on a diet deficient in the vitamins of the B complex but supplemented with 15 μ g. of thiamin per rat daily except Sunday. When growth had ceased (at the end of 4 weeks) the diet was further supplemented with 20 μ g. of riboflavin and 15 μ g. of pyridoxin plus one of the substances to be tested, which included calcium pantothenate, the equivalent of 5 gm. of liver in the form of a filtrate from which thiamin, riboflavin, and pyridoxin had been removed by repeated adsorptions on fuller's earth, and the residue from the molasses preparation previously described as stimulating growth and preventing graying (E. S. R., 84, p. 561).

The various observations reported are thought to demonstrate that the pantothenic acid requirement for maintaining normal color of the fur is greater than for growth, or that some additional factor, or factors, is required. As noted above, biotin has been suggested by György and Poling and *p*-aminobenzoic acid by Ansbacher as antiachromotrichia factors. Preliminary tests showed that inositol, while improving the growth of the controls, did not alter the rate of growth or improve the condition of the fur to any greater extent than calcium pantothenate. The diet employed was sufficiently high in casein to rule out the possibility of choline deficiency, and the addition of choline did not further improve the filtrate factor deficiency condition.

Nicotinic acid derivatives in human urine and their determination, W. A. PERLZWEIG, E. D. LEVY, and H. P. SARETT (*Jour. Biol. Chem.*, 136 (1940), No. 3, pp. 729-745, fig. 1).—Difficulties encountered in the determination of nicotinic acid in the urine by the various methods hitherto reported are summarized, and methods are proposed in which hydrolysis with concentrated hydrochloric acid plus a very small amount of concentrated nitric acid is used for the preparation of the material for the determination of total nicotinic acid, including nicotinamide and nicotinuric acid but exclusive of trigonelline, and

subsequent alkaline hydrolysis for the determination of trigonelline. Lloyd's reagent at a relatively high H-ion concentration (pH 1 or less) is used to adsorb the nicotinic acid derivatives, with subsequent recovery of the active material by washing with dilute acid and eluting with dilute alkali. Reaction with *p*-aminomethylphenol sulfate, as employed by Bandier and Hald (*E. S. R.*, 82, p. 586), was found to be the most satisfactory of various reactions proposed for the color development, the readings being made in an Evelyn photoelectric colorimeter with the 400 filter.

The advantages and limitations of the method described are discussed, and data are reported on its application.

Subjects on an adequate diet were found to excrete daily from 1 to 3 mg. of nicotinic acid derivatives exclusive of trigonelline, the latter amounting to from 20 to 29 mg. daily on diet without coffee and up to 200 mg. daily with coffee. Following the ingestion of pure nicotinic acid in doses of from 100 to 500 mg. daily, the increases in both fractions excreted accounted for only from 10 to 25 percent of the ingested nicotinic acid.

Vitamin B₆ (pyridoxin) deficiency in human beings.—Further studies, with special emphasis on the urinary excretion of pyridoxin, T. D. SPIES, R. K. LADISCH, and W. B. BEAN (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 10, pp. 839, 840).—A method for detecting pyridoxin deficiency by the response in urinary excretion to a test dose is described, and data are reported on its application. Under the conditions specified the normal subjects examined excreted from 6.7 to 10.9 percent of the injected pyridoxin as compared with from 0.0 to 0.2 percent excreted by subjects maintained on a pyridoxin-free diet for 3 weeks, from 0.0 to 0.5 percent by ambulatory patients suspected of pyridoxin deficiency, and from 5.4 to 13.2 percent by cured patients.

Vitamin C studies on paprika [trans. title], T. JACHMOWICZ (*Biochem. Ztschr.*, 307 (1941), No. 5-6, pp. 387-399, fig. 1).—A number of varieties of paprika, classified as vegetable and condiment varieties, were analyzed for vitamin C content by 2,6-dichlorophenolindophenol titration of a metaphosphoric acid extract of the fruit flesh. Seeds and placenta were discarded. The influence of cooking and of refrigerated and frozen storage was also investigated. The results (tabulated) are interpreted as indicating that cooking caused little actual destruction of vitamin C, but due to the solubility of the vitamin some was lost into the cooking water. In the cooking water there was some destruction, especially in the first 10-min. period before the soluble oxidases were destroyed. This loss due to oxidation was diminished by the use of vinegar in place of water. Storage at about 4° C. for as long as 1 mo. caused little or no loss of vitamin C, but freezing storage of unblanched fruits at -10° to -20° caused considerable loss (33-93 percent) in this period. Blanching previous to freezing did not reduce the loss. Values for the fresh fruits ranged from 112 to 214 mg. percent in the vegetable varieties and from 32 to 342 mg. percent in the condiment varieties. Paprika fruits packed in vinegar either with or without preliminary storage in a 12 percent salt solution lost most of their vitamin C.

Concentration of ascorbic acid in the plasma during the treatment of infantile scurvy, R. L. MINDLIN (*Jour. Ped.*, 17 (1940), No. 5, pp. 621-625, figs. 3).—Changes taking place in the plasma concentration of ascorbic acid in three infants during the healing of scurvy on vitamin C treatment are reported as evidence of the inadequacy of the ascorbic acid level in the plasma as an index of vitamin C nutrition. The three patients became symptom free within 48 hr. of the beginning of treatment, and X-ray evidences of healing were demonstrable in from 11 to 13 days in spite of wide differences in the ascorbic acid

concentration of the plasma. Immediately prior to the doses which resulted in a marked rise in the fasting level of ascorbic acid, the plasma values for the three subjects were 1, from 0.2 to 0.3, and 0.1 mg. per 100 cc.

"From the evidence reported herein and that available in the literature, the following statement may be made regarding the plasma ascorbic acid: A single, high fasting value indicates adequate ascorbic acid nutrition; a single, low fasting value indicates absence of ascorbic acid saturation, but not how far removed saturation may be; it has little value in the precise measurement of ascorbic acid undernutrition. Such measurement is better made by the determination of the ascorbic acid content of whole blood, the white cell-platelet fraction of blood, or the plasma concentration responses to parenterally administered test doses of ascorbic acid."

Vitamin K in hemorrhagic disease of the newborn infant, C. E. SNELLING (*Jour. Ped.*, 17 (1940), No. 5, pp. 615-620, fig. 1).—Daily administration by mouth of 1-mg. doses of 2-methyl-1,4-naphthoquinone to 60 mothers for from 2 to 16 days before delivery had no effect on their prothrombin times as judged by comparison with values obtained on a group of 100 mothers not receiving the therapy. Treatment of the mothers did, however, produce a shorter prothrombin time of the cord blood of infants, 64 percent of whom had prothrombin times within the interval of 30-60 sec., 34 percent in the interval of 60-90 sec., and only 2 percent with longer prothrombin times. Infants of untreated mothers showed a distribution of 31, 39, and 29 percent in these groups, respectively.

In 11 cases of hemorrhagic disease of the newborn the prothrombin times varied from 160 sec. to no clot formation at all; after the bleeding had been arrested by various methods this time was 95 sec. or less. In the treatment of other infants with hemorrhagic disease it was found that vitamin K by mouth might not be retained or absorbed. Administered intravenously, the synthetic vitamin (2-methyl-1,4-naphthoquinone) produced no ill effect, lowered the prothrombin time, and stopped the bleeding. Such treatment, with transfusion in addition, if hemoglobin is low, is recommended. Vitamin K therapy of the mother is recommended as a preventive measure for hemorrhagic disease.

The author had the technical assistance of W. Nelson.

The nature of the anti-alopecia factor, D. W. WOOLLEY (*Science*, 92 (1940), No. 2391, pp. 384-385).—This is a brief announcement that both phytin, the salt of inositol phosphoric acid, and inositol are curative of mouse alopecia. "The above facts indicate that the mouse antialopecia factor is inositol or its derivatives. They suggest that inositol exists in liver in alkali-labile combination with a large molecule which renders the former nondialyzable. While it has been reported that inositol stimulates the growth of certain strains of yeast, its place in the nutrition of higher animals has not previously been observed."

Identification of the mouse anti-alopecia factor, D. W. WOOLLEY (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 29-34).—This is the detailed report of the above noted investigation.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt.*, 1941, pp. 13-18).—This annual report of the program and accomplishments of the Textiles and Clothing Division (*E. S. R.*, 84, p. 855) deals with the work on cotton hose, work clothes for women, making and buying clothing and household furnishings, protection of fabrics against damage by micro-organisms, and miscellaneous studies on fibers and fabrics.

Bacterial degradation of felts.—I, A bacteriological technique for studying the degradation of felts, J. W. APPLING, O. A. SMITH, and D. FRONMULLER

(*Paper Trade Jour.*, 113 (1941), No. 7, pp. 30-34, figs. 4).—"A critical analysis and evaluation of the steps necessary for measuring the amount of bacterial degradation in terms of reduction in tensile strength have been made for the purpose of standardizing the technic used."

Use of the tension presser for determining shrinkage (*Rayon Textile Mo.*, 22 (1941), No. 11, pp. 75-76, fig. 1).—In the test, applied to fabrics other than cotton and linen, a 10-in. square with sides parallel to warp and filling directions, respectively, is outlined, with the help of a rigid marking device, on a test specimen 22 by 22 in., and the corners and midpoints of the square are marked with indelible ink. The sample is washed under specified conditions, squeezed to remove excess water, smoothed out on the bed of a flat-bed press, and pressed until dry by lowering the head of the machine. Fifteen min. after removal from the bed of the press the dimensional change in warp and filling directions is determined.

The stability test is then applied to the specimen, which is dampened with a spray and mounted on a mechanical tensioning device consisting of four clamp bars, two of which are movable and two fixed. Weights are applied to the movable clamp bars, first in the direction of greatest change, immediately followed by application in the direction of least change. If gains of over 2 percent are obtained after applying the recommended weight, the fabric is retested using a smaller weight. The fabric is held under tension while being dried by placing a metal plate on the fabric and drying through the plate without moving it by use of a hand iron. After release of the tension, the fabric is allowed to lay flat for 15 min., when dimensional changes in warp and filling directions are again determined.

A fabric to be considered satisfactory in laundering or wet cleaning from a stability standpoint must not show more than a 2-percent plus or minus dimensional change in warp or filling measurement by this tension pressing method when compared with the original measurements. Fabrics satisfactory for dimensional stability when ironed with firm, moderate, light, and smooth tension in hand pressing are classed in groups 1-4, respectively. A fabric is classified as unstable when the tension necessary to restore it to ± 2 percent of the original dimension is impractical to apply in hand pressing.

Physical properties of cotton corduroy for boys' clothing, G. WHITE (U. S. D. A.). (*Amer. Dyestuff Rptr.*, 30 (1941), No. 12, pp. 295-298, 315-316, figs. 3).—Twelve cotton corduroy fabrics, representing 3 different types of construction of ground weave (described and illustrated), were purchased directly from manufacturers. The fabrics, sampled so as to show up variations within any one fabric, were tested by methods noted for breaking strength, weight, durability as measured by resistance to abrasion, colorfastness to light and to washing, changes produced by laundering, and other physical properties.

The data recorded indicate that the fabrics differed widely in nearly all physical properties, except compressional resilience; that the amount of finishing material was high in most cases; that variations in breaking strength were fairly large for many fabrics; that laundering increased the count of many fabrics by a small amount, increased their thickness by from 13 to 24 percent, decreased their weight (with one exception) by from 3 to 13 percent due to loss of finishing materials and of fibers from tufts, and decreased their breaking strength by from 1 to 27 percent in most cases, although some gained in breaking strength. Abrasion of the laundered fabrics in filling-wise and also warp-wise direction caused three-fourths of them to change in strength from between -5 and +1 percent, indicating that the ground yarns received little damage in abrasion. Changes in both breaking strength and thickness indicated that most

of the fabric stood up fairly well under abrasion. All but two of the fabrics stood up well in tests of colorfastness to light, and colorfastness to laundering showed that most of the corduroy fabrics could be washed satisfactorily so long as no bleaching agent was used.

The data were subjected to statistical analysis to obtain additional information concerning the variation between fabrics with respect to various physical properties. On the basis of these results, specifications are proposed in order to define the minimum quality of medium-weight cotton corduroy for boys' wear. These proposed requirements are under consideration as tentative specifications by a subcommittee of the American Society for Testing Materials.

Serviceability of selected types of cotton and rayon knit underwear, R. E. ROGERS, M. B. HAYS, and J. J. BROWN (*U. S. Dept. Agr., Tech. Bul. 803 (1942), pp. 22, figs. 5*).—Cotton and rayon yarns of known history, knit into fabrics of comparable construction, all of which is noted in detail, were made into vests for girls and union suits for boys and placed in institution service. The 26 girls and 25 boys wore alternately a cotton and a rayon garment. Unworn garments, withheld for test at the beginning and end of the study, and 3 garments of each type and each fiber removed at regular intervals of 8 periods of wear and laundering were subjected to analysis. The bursting strength and the dry breaking strength of the new cotton material was greater than that of the new rayon and the wet breaking strength much greater. Both the copper number and the fluidity measurements showed that the cellulose of the cotton was much less damaged than that of the rayon.

With wear and laundering the breaking strength, bursting strength, and moisture decreased, while the copper number, fluidity, and ash increased. Weight per square yard and thickness had increased at the eighth wash because of shrinkage. Although there was a slow decrease from this time on, the values at the end of wear were greater than the original values. Fluidity tests, the most sensitive measure used in the study, showed that both cotton and rayon suits were more deteriorated chemically at 24 periods than the corresponding vests at 40. The vests lasted approximately $1\frac{1}{2}$ times as long as the suits. When cotton was compared with rayon in an analysis of variance, type of fiber was significant for bursting strength and highly significant for wet breaking strength, copper number, and fluidity. The cotton and rayon suits wore on an average 30.7 and 17.5 periods, respectively, and the vests 43.5 and 34.8 periods, indicating that cotton garments lasted in general about $1\frac{1}{2}$ times as long as the rayon. Cotton was more suitable than rayon for the strenuous service to which union suits were subjected, although not particularly more serviceable for the vests. It was observed that more mending was required as the percentage of elongation decreased with increased service.

HOME MANAGEMENT AND EQUIPMENT

[Economic studies at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1941, pp. 2-7*).—This report of the Division of Family Economics (E. S. R., 84, p. 856) points out some practical applications of the findings on consumption patterns of farm, village, and small-city families at different income levels; methods of improving family diets; nutritive value of free school lunches; and 5-ct. milk in the diets of families on relief.

Household equipment and housing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1941, pp. 18-21*).—This annual report of the Division of Housing and Household Equipment (E. S. R., 84, p. 857) gives briefly the findings concerning electric hand irons, refrigerators, gas and electric ranges, and cooking utensils, and the minimum requirements for working space

and storage areas in kitchens for families of different sizes in middle- and low-income groups.

Laboratory studies of methods for cleansing of eating utensils and evaluating detergents, F. W. GILCREAS and J. E. O'BRIEN (*Amer. Jour. Pub. Health*, 31 (1941), No. 2, pp. 143-150, figs. 3).—This address presents the results of an experimental study to determine the effectiveness of an efficient detergent in water at 100°-120° F. (followed by rinsing with clean water at 120° or over) in removing bacterial soil from drinking glasses, and considers in detail a practical functional test for determining the cleansing index of basic detergent materials and proprietary detergents in removing protein and also greasy soil. "Based on the data accumulated in these studies, an efficient detergent for cleansing of eating, drinking, and cooking utensils may be defined as a substance or compound soluble in water, which at a temperature of approximately 120° will provide complete removal of all types of characteristic soiling materials in a short period of time; will produce a free-rinsing surface; will reduce to a minimum the formation of a film of precipitated mineral salts and similar substances on the washed surface; and will function effectively in waters of varying hardness.

Survey of State laws and judicial decisions on bedding and upholstery, S. MERMEN, J. M. MAYER, and S. P. KAIKANOVSKY (*U. S. Dept. Agr., Agr. Adjust. Admin., Consum. Counsel Ser., Pub. 9* (1940), pp. VII+160).—"This survey consists of three principal parts: (1) A presentation of the provisions of State laws regulating the manufacture and sale of bedding and upholstery, (2) a summary of Federal and State court cases in this field, (3) a chart together with a summary thereof comparing State sanitation and labeling requirements for new bedding and upholstery." The survey covers laws and decisions up to January 1940.

A comparison of qualities and prices of sheets available in Missouri stores, N. G. BENNETT (*Missouri Sta. Bul. 436* (1941), pp. 16).—Ninety-six brands of sheets, 21 sold as percale and 75 as muslin, and 56 brands of sheeting were included in this study, which showed that there was no definite relation between price and quality as judged by such factors as weight per square yard, tensile strength, and thread count. In most cases an increased amount of sizing was related to a decrease in price. When the cost of laundering at a commercial laundry was computed by weight for the estimated period of wear and added to the initial cost, the medium-weight muslin sheet, although less durable than the one of heavy muslin, proved to be the more economical, with an estimated saving of \$6.19. Similarly, the percale sheet was estimated as being \$2 cheaper than the average weight muslin sheet. Sheets made from unbleached sheeting were less expensive than those made from bleached sheeting of the same brand, but there was no difference in durability. Ready-made sheets of bleached sheeting cost only 6 ct. more than home-made sheets of the same brand of sheeting. The tested sheets shrunk more in the warp, or length, than they did in the filling threads, and the sheets with high thread count showed less shrinkage than those with a low thread count.

MISCELLANEOUS

Fifty-first Annual Report [of Alabama Station], 1940, M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1940*, pp. 45, fig. 1).⁴

Fifty-fourth Annual Report, Colorado Agricultural Experiment Station, [1941], I. E. NEWSOM (*Colorado Sta. Rpt. 1941*, pp. 62).⁴

⁴The experimental work reported is for the most part referred to elsewhere in this issue.

Publications available from the [Kansas] Agricultural Experiment Station (*Kansas Sta. Cir.* 205 (1941), pp. [4]).—The available bulletins and circulars, classified under agricultural economics, agricultural production, and home economics, are listed.

Bimonthly Bulletin, [November 1941] (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 2, pp. 19, figs. 7).—In addition to several articles noted elsewhere in this issue, this number contains North Dakota Farm Prices, by W. L. Ettesvold (p. 18), and Soil Science for the Layman, by W. M. Johnson (p. 19).

Agricultura Experimental, [September–October 1941] (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 1 (1941), No. 5, pp. [8], figs. 7).—In addition to articles noted elsewhere in this issue, the number contains Algodon para la defensa [Cotton in Defense], by J. P. Rodríguez (pp. [2–3]); and Ganancia de \$24.00 por cuerda tuvieron los cosecheros de algodon "Sea Island" en la costa noroeste en 1940 [Profits of \$24 per Cuerda from Sea Island Cotton on the Northeast Coast Area in 1940], by L. M. Géigel (pp. [4–5]).

Recent investigations in tropical and subtropical agriculture, A. F. HILL (*Chron. Bot.*, 6 (1941), No. 19–20, pp. 441–443).—A digest of papers presented at the International Congress of Tropical and Subtropical Agriculture, held at Tripoli in March 1939.

The natural resources of the Lesser Antilles, W. H. HODGE. (Mass. State Col.). (*Chron. Bot.*, 6 (1941), No. 19–20, pp. 448–449).—A general discussion.

La agricultura en la Republica Argentina, L. R. PARODI (*Chron. Bot.*, 7 (1942), No. 1, pp. 19–23).—A general outline including cereals, oil plants, fruits, sugar plants, tobacco, textiles, horticultural and forage crops, etc. (15 references).

The Falkland Islands, C. SKOTTSBERG (*Chron. Bot.*, 7 (1942), No. 1, pp. 23–26).—On the natural resources, with special reference to minerals and plants.

NOTES

Arkansas University and Station.—The resignations are noted from the department of rural economics and sociology of Drs. W. H. Metzler, associate professor and associate, and E. E. Sparlin, assistant professor and assistant. Recent appointments include Arthur H. Thompson as instructor in agricultural engineering, and Runyon Deere and Aubrey Enoch as scientific assistants in the Cotton Branch and Fruit and Truck Branch Stations, respectively.

Colorado College and Station.—Dr. Ralph M. Weihing and Robert S. Whitney, assistant agronomists, have been granted leave of absence for military service. Otto H. Coleman, assistant agronomist, has resigned to take a similar position with the Division of Sugar Plants, U. S. D. A. Bureau of Plant Industry at Meridian, Miss. Frank J. Kapel, assistant in range management, has been granted 6 months' leave of absence as research assistant with an aircraft corporation.

Iowa College and Station.—A new agricultural engineering laboratory is under construction. Dr. Frank D. Blohm has been appointed assistant professor of veterinary pathology.

Kansas College.—Leonard B. Harden, assistant professor of agricultural economics, has resigned.

Massachusetts Station.—Dr. Helen S. Mitchell, research professor of home economics, who has been on leave of absence since July 1, 1941, for the purpose of assisting in the organization of the program of the U. S. Office of Defense Health and Welfare Services, has resigned in order to continue her services with that office.

Minnesota Station.—Dr. F. R. Immer, acting vice director since July 1941, has been appointed vice director in addition to his previous duties as professor of agronomy and plant genetics. Otto W. Swenson, agronomist and instructor at the Grand Rapids Substation, will become farm superintendent at University Farm vice L. B. Bassett, who is to retire on July 1.

A committee headed by the vice director and including a biochemist, an agronomist, and a plant pathologist has been appointed to plan and carry out research to determine the possibilities of leafy spurge as a rubber-yielding plant. Greenhouse plantings have been made to provide enough spurge latex for chemical and physical tests.

Montana College and Station.—Dr. Royse P. Murphy, assistant professor of plant breeding and assistant in agronomy and plant genetics in the Minnesota University and Station, has been appointed associate professor of agronomy and associate agronomist vice Dr. A. M. Schlehuber, resigned. Gestur W. Johnson, assistant in home economics research in the Colorado Station, has been appointed assistant in chemistry vice Donald R. McCormick, resigned.

New York State Station.—In an effort to speed up the testing of new spray and dust materials for the control of fruit diseases, three types of precision sprayers have been designed. For the most rapid testing of fungicides, particularly sulfur, glass slides are sprayed with the materials under test and the spore suspensions of the desired fungus are applied to the slides to determine

the comparative effectiveness of different sprays in killing the fungus. More reliable tests on foliage grown in the greenhouse are made with a horizontal type of sprayer which makes it possible to spray one half of a leaf, leaving the other half as a check. To approximate orchard conditions more closely, a small model orchard sprayer has been set up in the laboratory. This does not give as accurate control as the precision sprayers, but very uniform and reproducible coverage is obtained by placing the potted trees on a turntable and passing them through the spray for a definite period of time.

Dr. Oscar H. Hammer, assistant in research (entomology) at the Hudson Valley Fruit Investigations Laboratory, has resigned to conduct investigations on the control of fruit insects for a chemical company in Michigan. He has been succeeded by J. L. Brann, Jr.

Ohio Station.—Dr. William D. Pouden has been appointed assistant in the dairy department, and Cecil Fryman in charge of the Hamilton County Experiment Farm, the latter vice W. E. Weaver, retired.

Pennsylvania College and Station.—The retirement is noted of M. S. McDowell, director of agricultural extension since 1915 and associated for 8 years previously with the chemical and extension work of the institution.

Rhode Island Station.—L. M. Murphy, assistant pomologist, has been granted military leave of absence.

South Carolina Station.—Dr. G. B. Killinger, soil scientist, has been appointed associate agronomist in the Florida Station.

South Dakota Station.—Recent appointments to the staff include Dr. Leslie E. Johnson, associate animal husbandman; William H. Burkitt, assistant animal husbandman; Dr. Leon C. Snyder, assistant horticulturist; L. T. Smythe and Virgil H. Wintrobe, assistant economists; F. M. Skelton, assistant dairy husbandman; Helen M. Ward, assistant home economist; David Williams, assistant poultry husbandman; and Howard M. Sauer, assistant rural sociologist. Three members have been granted leaves of absence for Army service: Gerald E. Korzan, assistant in agricultural economics; James C. Watson, assistant in animal husbandry; and Dr. W. E. Poley, head of the department of poultry husbandry. W. H. Peterson and Norris J. Anderson, assistant agricultural economists, are on leave of absence for graduate study, and Barbara Bailey, research assistant in home economics, and Vernon W. Noordsy, assistant poultryman, have resigned to go into commercial work.

Vermont University and Station.—Joseph E. Carrigan, director of extension, will succeed Dean J. L. Hills (E. S. R., 86, p. 433) on July 1 as dean of the College of Agriculture and director of the station.

Wyoming University and Station.—J. A. Gorman, assistant professor of animal production and assistant animal husbandman, was inducted into the Army on January 20 as First Lieutenant in the Quartermaster Corps.

American Country Life Association.—General operations of this association have been suspended. Its files have been stored at Purdue University, and requests for back numbers of publications may be sent to O. F. Hall at that institution. Youth Section Activities are being handled by E. L. Kirkpatrick, 744 Jackson Place, Washington, D. C. The Committee on Rural Education may be reached through its secretary, Iman Schotzman, 5835 Kimbark Ave., Chicago, Ill.

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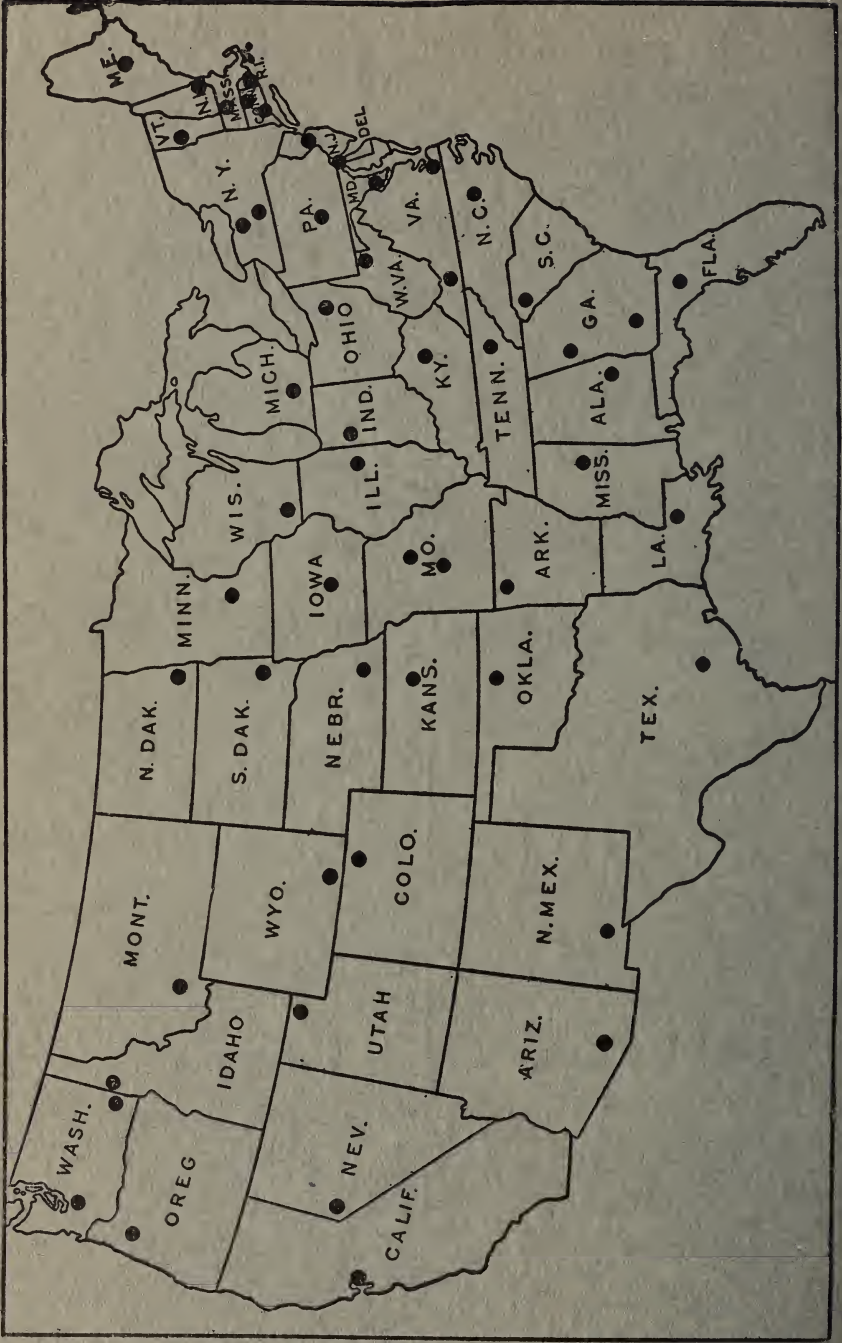
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UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

Vol. 86

JUNE 1942

No. 6

EXPERIMENT STATION RECORD



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EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

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WAR-TIME BIBLIOGRAPHICAL AIDS IN AGRICULTURAL RESEARCH

As a groundwork for further study and a means for avoidance of duplication, agricultural research workers depend at all times on bibliographical aids, but under war conditions it is particularly important that such aids should be fully mobilized and freely available. Existing agencies, such as the *Record*, more or less automatically reflect the change of emphasis in current experimentation and to the extent of their resources endeavor to render a service of immediate applicability to the new problems at hand. Additional agencies also arise to meet special needs, and still other auxiliaries which may have been conceived and developed prior to the emergency find an unexpectedly hearty welcome because of the opportuneness of their appearance.

One of the guides to publications related directly to the war has been *Agriculture in Defense*. This is a mimeographed list compiled in the Library of the U. S. Department of Agriculture. Most of the approximately 100 articles covered in each weekly issue are listed only by title, but in some cases brief annotations and quotations are given. Among the subdivisions are war and postwar planning, Government policy and program, food notes, labor, prices, fats and oils, forestry and lumber, fruit and vegetables, livestock and meat, machinery and storage and refrigeration.

Increased attention to Latin America may be noted from a number of sources. Of direct bibliographical interest is the *Inter-American Bibliographical Review*. This is a quarterly publication of the Inter-American Bibliographical and Library Association and is issued by the Educational Research Bureau at 1320 M Street NW., Washington, D. C. Its material includes annotated lists of articles related to inter-American affairs published in English and recent Latin-American publications and periodicals. In this connection it may be of interest to note that the same agency has issued a reference index to 12,000 Spanish American authors. Of somewhat similar scope is the List of Latin American Serials, which is a survey of exchanges available in United States libraries and is prepared for the American Library Association committee on library cooperation with Latin America.

While not identified with the war effort, the establishment by *Biological Abstracts* of a section of animal production and veterinary

science is a timely development. The section, which now may be obtained separately, segregates abstracts of animal breeding; physiology, pathology, and anatomy of livestock; animal husbandry, dairy husbandry, poultry, ranch, fur, and pet stock; veterinary science; veterinary parasitology and insect pests of animals; and dairy bacteriology.

Special mention may also be appropriately made in this connection of the appearance of the second edition of Standardized Plant Names. It is announced that this revision of the 1923 edition, prepared for the American Joint Committee on Horticultural Nomenclature, has been rendered imperative by a substitution for the American Code of the International Rules of Botanical Nomenclature. Other factors entering in have been the need to take account of the approximately 3,000 new plants, including importations, hybrids, strains, etc., which are being added annually under normal conditions to American horticulture and agriculture. There has also been a broadening of the field by the admission of terminology related to fields other than horticulture, notably agronomy, forestry, gums and latex, pharmacy, spice and condiments, range and wildlife management, and soil conservation.

In the making of this revision a large amount of cooperation from institutions, organizations, and individuals has been availed of. Among these has been the U. S. Department of Agriculture, which in 1939 set up a standing committee on plant names, headed by Dr. M. A. McCall of the Bureau of Plant Industry, "to consider and to recommend for use by the Department such plant nomenclature, both scientific and common names, as may be desirable."

Simplification of nomenclature may seem somewhat remote from the war, but, as already indicated, time-saving aids were never more essential. It is fortunate that those discussed and others of similar scope have become available.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Bureau of Agricultural Chemistry and Engineering] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt., 1941, pp. 2-69*).—This report covers work on vegetable, fruit, cereal, and eggs and egg products; sugarcane and cane sugar; sugar beets and beet sugar; farm-made sirups and sorgo sugar; honey; starches; hemicelluloses; use of sweetpotatoes as feed; oil, fat, and wax investigations; proteins of agricultural food products; chemistry of enzymes and of miscellaneous plant constituents; microbiology of food products; pharmacology of possible food contaminants; effects of industrial contaminants on the composition of plants; and the chemistry of weed eradication.

Also included is the work on industrial utilization of farm products and by-products and on naval stores investigations, and special research (under Bankhead-Jones Act of June 29, 1935) on allergens of agricultural products, animal and plant viruses, preserving biological specimens related to agriculture, and on soybeans and soybean products, together with the work of the four regional research laboratories with corn, wheat, agricultural residues, cotton, sweetpotatoes, apples, vegetable wastes, potatoes, quick freezing of poultry, tobacco, milk products, and tanning materials.

[Chemical work of the U. S. Department of Agriculture] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 227-230*).—Work of the regional research laboratories and various Department agencies is noted on dehydration and other ways of preserving foods, and research on fibers, hides, and skins.

[Chemical investigations by the Georgia Station] (*Georgia Sta. Rpt. 1941, pp. 108-112, 119-125, figs. 3*).—This report notes peach storage studies, analyses of pimientos, and food processing, including freezing lima beans, pilot refrigeration plant operations, peach peeling, and peanut processing.

An improved automatic continuous percolator, M. S. SCHECHTER and H. L. HALLER. (*U. S. D. A.*). (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 7, pp. 481-482, fig. 1*).—Some improvements in an apparatus previously described (*E. S. R., 80, p. 295*) were found to be needed. A drawing of the revised set-up accompanies the note.

Magnetic stirrer for use in the cup type of moisture-transfusion apparatus, H. K. BURR and A. J. STAMM. (*U. S. D. A.*). (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 9, p. 655*).—Three horizontally mounted pulleys serve as the supports for three moisture-transfusion cups (glass crystallizing dishes) slightly smaller in diameter than the pulleys. The cups may be clipped to the pulleys so as to be readily removable. Rings made by bending 18-gage sheet-iron strips 1 cm. wide into circular cylinders 3 cm. in diameter were completely covered with tinfoil on the circular surfaces, as well as on the ends, to make sealed drums. Small tinfoil vanes were sealed horizontally on the top faces of the drums. These drums weighed only 5 gm. each. They were floated on the liquid in the crystallizing dishes, after which the membranes were sealed to the top. Three electromagnet coils, taken from old electric doorbells, were so mounted that each magnet surface just cleared the side of one of the crystallizing dishes. These electromagnets were operated from the secondary of an ordinary doorbell transformer

(18 v.). When the pulleys were operated at about 60 r. p. m., the drums were held in a position near the electromagnets as the pulleys and crystallizing dishes rotated about their own axes. The vanes on the drums caused an efficient stirring of the air. The rotation of the crystallizing dishes with respect to the stirring drums also adequately provided a continual formation of a new liquid surface.

A powder compactor for air-permeation experiments, E. L. GOODEN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 483-484, figs. 2).—Essentially the device consists of a sample tube fitted with a porous support for the sample and with a feed funnel having a stem of a diameter equal to that of the tube, a plunger fitting the tube but partly cut away at one side, and a plunger stem formed into shallow zigzag bends to the height to be occupied by the powder and continued as a straight handle. The powder placed in the tube above the plunger feeds gradually through the space between the cut side of the plunger and the tube wall during vertical oscillation of the plunger, while turning of the plunger about its vertical axis assists in making the feeding and tamping even and uniform.

Observations with a photoelectric hemoglobinometer, P. L. McLAIN and G. J. PASTORIUS (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 6, pp. 1054-1057, figs. 2).—The instrument, an experimental model representing a simple form of photoelectric colorimeter consisting essentially of a single photoelectric cell, a filter, a holder for solution containers, and a light source, is described briefly as to construction and operation. A comparison of photometer readings with hemoglobin measurements by the gasometric method of Van Slyke and Neill and the blood iron method of Wong indicated that the photometric method was suitable for hemoglobin determinations. "Single readings were reliable within 0.3 to 0.7 gm. of hemoglobin per 100 cc., depending on the total hemoglobin content of the sample. Multiple readings, occupying an insignificant amount of extra time, narrowed the limits of error."

A shaping lathe for graphite electrodes used in spectrochemical analysis, K. R. MAJORS and T. H. HOPPER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 647-648, figs. 2).—The essential features of the device reported upon consists of a head stock carrying a hollow housing, a shaping or trimming tool, and the concentric inner bit which forms the crater; and a guide trough and sliding carriage to support the electrode during the forming operation. The guide trough has the necessary height and alignment adjustments.

Electrokinetics.—XXIV, The electroviscous effect, I. XXV, The electroviscous effect, II. (Minn. Expt. Sta. et al.). (*Jour. Phys. Chem.*, 45 (1941), Nos. 5, pp. 866-876, fig. 1; 6, pp. 943-953, figs. 4; abs. in *Minnesota Sta. Rpt. 1941*, pp. 28-29, 30-31).—The two papers of this series (E. S. R., 85, p. 580) here noted deal with the electroviscous effect as exhibited, respectively, by solutions of sodium gum arabic and of calcium and sodium caseinates.

I. *In systems of sodium gum arabic*, D. R. Briggs.—The Smoluchowski equation for the electroviscous effect has been put into a form which makes possible its testing against experimental data obtained from measurements of the electrokinetic potentials (ζ), specific conductivities (λ), and relative viscosities (η_s/η_0) on colloid-containing solutions. When the equation is written

$$\frac{1}{\eta_{sp}} = -\frac{3e^2}{8\pi^2r^2} \cdot \frac{\zeta^2}{\lambda(\eta_s - \eta_0)} + \frac{1}{K\phi}$$

and the values of $1/\eta_{sp}$ and $\zeta^2/\lambda(\eta_s - \eta_0)$ are chosen as coordinates in plotting the data, the values of $K\phi$ and r can be obtained from the intercepts and slopes,

respectively, of the straight line obtained, provided the Smoluchowski equation is valid. Plotted in this manner, the data from sodium gum arabic, without and with the addition of small amounts of sodium chloride, fall on a straight line, and the values of $K\phi$ obtained are proportional to the colloid concentration. This supports the validity of the equation. The slopes of the lines, however, at varying colloid concentrations, change in such a manner that the calculated value of r appears to decrease directly as the concentration of colloid increases. To this extent the equation is apparently not verified.

II. In systems of calcium and sodium caseinates, C. L. Hankinson and D. R. Briggs.—The authors here present measurements of electrokinetic potentials (ζ), specific conductivities (λ), and relative viscosities (η_s/η_0) on systems of both calcium caseinate and sodium caseinate, without and with the addition of small amount of the chloride of the cation common to the colloid. These data, when calculated and plotted as variables in the linear form of the electroviscous equation, fall on a straight line. The values of $K\phi$ calculated from the intercept are proportional to colloid concentration. This is in agreement with the results already obtained on sodium gum arabic systems. Other data concerning the protein systems and further comparisons between the protein and the gum systems are also noted.

A Pyrex all-glass microelectrophoresis cell, D. R. Briggs, (Minn. Expt. Sta.). (Indus. and Engin. Chem., Analyt. Ed., 12 (1940), No. 11, pp. 703-705, figs. 2).—The manufacture and use of a Pyrex all-glass microelectrophoresis cell and the electrical circuits are described. This equipment was designed for measurements of the electrophoretic velocity and solid particles suspended in highly nonconductive organic liquids, but the apparatus may be used as readily for aqueous systems. Certain advantages of construction and arrangement of the cell make it relatively easy to use.

Reversible aggregations of colloidal particles.—I, Centrifugal experiments on thixotropic iron oxide sols, W. HELLER. (Univ. Minn.). (Jour. Phys. Chem., 45 (1941), No. 8, pp. 1203-1227, figs. 11).—The author showed that when a thixotropic sol is centrifuged, it separates into an upper dilute sol phase and a lower concentrated phase, which is thixotropic. The experiments show that reversible aggregates (which can be destroyed by gentle shaking) develop in thixotropic sols. Their subsequent association to a gel structure leads to the transformation of the sols into gels. Centrifugation brings about settling of these reversible aggregates and their premature association. Besides the reversible aggregates, called "geloids" because they consist of minute elementary gels, irreversible ones are present in thixotropic systems in minor quantity. These settle swiftly in a centrifugal field, whereas the settling of the reversible aggregates is slow. In freshly shaken systems, settling of the irreversible aggregates starts immediately after centrifugation begins, whereas geloids start settling considerably later when they have again grown to a size such that settling becomes possible. The kinetics of the phase separation and the influence of various physical and chemical agencies upon this separation are discussed.

The reaction of ethyl glycinate hydrochloride with primary, secondary, and tertiary Grignard reagents, F. L. GREENWOOD and R. A. GORTNER. (Minn. Expt. Sta.). (Jour. Organic Chem., 6 (1941), No. 3, pp. 401-409).—Ethyl glycinate hydrochloride reacted with *n*-propylmagnesium chloride to give approximately a 75-percent yield of 2-amino-1,1-di-*n*-propylethanol-1. The ester hydrochloride was also treated with isopropylmagnesium chloride and aminomethyl isopropyl ketone and 2-amino-1,1-diisopropylethanol-1 were isolated from the reaction mixture. The ester hydrochloride failed to react with *t*-butylmagnesium chloride. Converting the amino group to the amino hydrochloride failed

to protect the amino group from the Grignard reagent. All of the Grignard reagents reacted with the ester hydrochloride to yield the hydrocarbon corresponding to the Grignard reagent, and all three hydrogen atoms can be replaced if the reaction is allowed to proceed for a sufficient time.

The origin of the humin formed by the acid hydrolysis of proteins.—IX, Hydrolysis in the presence of djenkolic and of thiazolidine-4-carboxylic acids, H. A. LILLEVIK and W. M. SANDSTROM. (Minn. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 4, pp. 1028-1030. fig. 1; *abs. in Minnesota Sta. Rpt. 1941*, p. 29).—In continuation of much earlier work (E. S. R., 52, p. 108), the authors showed that djenkolic and thiazolidine-4-carboxylic acids are cleaved to formaldehyde and cysteine (or cystine) after hydrolysis for 24 hr. with 20 percent hydrochloric acid, as shown by polarographic analysis, the Sullivan colorimetric analysis (E. S. R., 70, p. 444), and condensation of the derived formaldehyde with tryptophan. It has been found that a lesser amount of formaldehyde, as obtainable from these precursor compounds, is needed to bring about the maximum insoluble humin than when formaldehyde is added as trioxymethylene.

Sulfur in proteins.—VI, Qualitative studies in the alkaline decomposition of cystine, H. V. LINDSTROM and W. M. SANDSTROM. (Minn. Expt. Sta.). (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 445-450).—Resuming a series earlier noted (E. S. R., 69, p. 483), the authors identified uvitic, uvitonic, and thiolactic acids for the first time as alkaline decomposition products of cystine and showed that these acids arise from the action of the alkali on the primary decomposition products, pyruvic acid, ammonia, and hydrogen sulfide.

Alanine was demonstrated as a product from a barium hydroxide decomposition. Since alanine was found to stabilize cystine somewhat in sodium and potassium hydroxide solutions but not in barium hydroxide solutions, a theory was put forth that alanine stabilizes cystine in alkaline solutions, the alanine arising from the decomposition of cystine and inhibiting the action of the cystine-labilizing factor, pyruvic acid. The result is that alanine is resynthesized and pyruvic acid (as well as any acetaldehyde derived from it) is removed by being condensed rapidly in sodium or potassium hydroxide but only slowly in barium hydroxide.

Studies on soybean carbohydrates, M. M. MACMASTERS, S. WOODRUFF, and H. KLAAS. (Ill. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 471-474).—This paper presents analytical data on sugars, galactans, and pentosans found in several edible varieties of soybeans from a very immature green vegetable stage to that of the mature seed. Total carbohydrates and total and reducing sugars tended to decrease as the beans became more mature, while galactans and pentosans tended to increase. Qualitative separation of hemicellulose fractions was attempted by methods heretofore employed with woody and herbaceous materials. The relatively large amount of protein present in soybeans interfered greatly in this procedure, but evidence was obtained that the hemicelluloses of soybeans are a mixture of galactoarabans containing galacturonic acid.

A study of the moisture in soybeans, A. C. BECKEL and F. R. EABLE. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 40-43, figs. 9).—The authors report in some detail the behavior of several varieties of soybeans as to various oil and protein contents in four oven-drying methods, namely: Air oven at 105° and 130° C. and vacuum oven at 80° and 105°. The changes in weight were followed continuously by means of an apparatus developed for that purpose.

The dissimilation of glucose by *Chaetomium funicola* Cke.—I, Glucose carbon partition, G. SEMENIUK. (Iowa Expt. Sta.) (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 261-268).—*C. funicola* slowly converted the glucose in Czapek-Dox solution mainly to carbon dioxide and mycelium over the entire tested period of 33 days' development. Products of the nonvolatile, nonacidic, and nonreducing class accumulated in the medium throughout this period. The maximum formation of these products occurred between the eighteenth and the twenty-sixth day of fungus development, when approximately 35 percent of the glucose carbon dissimilated in that period was converted into these products. Volatile and nonvolatile acids and volatile neutral compounds accumulated in only very small amounts. The medium gradually became alkaline with progressive development of the fungus. Ether extraction of the concentrated residual medium yielded a mixture of brownish, liquid fatty material and crystalline organic compounds possessing different melting points. Vigorous agitation of the culture medium by means of forced air did not hasten glucose dissimilation even though *C. funicola* grew throughout the medium.

The reducing properties of *l*-sorbose, F. K. BROOME and W. M. SANDSTROM. (Minn. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 4, pp. 234-235).—The reducing power of *l*-sorbose was determined by a ferricyanide method on a preparation carefully purified until its properties agreed with the best recorded data. The direct titration of the ferrocyanide with standard ceric sulfate is satisfactory in the concentration range of from 0.01 to 0.7 percent. Fructose, the only other common ketohexose, was found to have approximately 10 percent greater reducing power. These values are sufficiently similar to bear out the hypothesis that the configurations about the third and fourth carbon atoms are important in determining the reducing properties, these two ketohexoses having similar configurations on these carbon atoms and reducing properties of the same order of magnitude.

The chemistry and toxicity of selenium compounds, with special reference to the selenium problem, E. P. PAINTER. (N. Dak. Expt. Sta. and Univ. Minn.). (*Chem. Rev.*, 28 (1941), No. 2, pp. 179-213).—A critical survey of the literature through 1940 on organic selenium compounds and their toxicity, with especial reference to the nature of the form in which selenium occurs in seleniferous plants and grains. The subject matter is discussed under the four headings the selenium problem in agriculture, methods of analysis, organic compounds of selenium, and the properties of selenium in plants and their relation to known compounds of selenium and sulfur. One hundred and eighty-six references are appended.

Organic selenium compounds: Their decomposition in alkaline solutions and other properties related to the behavior of selenium compounds in cereals, E. P. PAINTER, K. W. FRANKE, and R. A. GORTNER. (S. Dak. and Minn. Expt. Stas.). (*Jour. Organic Chem.*, 5 (1940), No. 6, pp. 579-589).—Organic diselenides, selenium ethers, and seleninic acids of acetic, β -propionic, *n*-propyl, and benzyl radicals were synthesized and their decomposition studied by hydrolyzing in alkaline solutions. Diselenides, like disulfides, decompose in alkaline solutions. Inorganic selenide and selenite formed. Selenium ethers, like sulfur ethers, were stable, but the selenide of propionic acid decomposed in alkaline plumbite to give nearly all the selenium as lead selenide. The selenium from seleninic acids of organic acids appeared to be quantitatively cleaved, while the seleninic acids of hydrocarbons were partially cleaved. Selenites and lead selenide were formed. It is probable that the mechanism of the decomposition of these compounds is the same as that of the corresponding sulfur compounds. The

relationship of the selenium compounds in plants, and synthesized compounds, in regard to their stability in different solutions and upon storage, is discussed.

Determination of unsaturation in the terpene series, L. M. JOSHEL, S. A. HALL, and S. PALKIN. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 447-449, figs. 4).—The usual halogen absorption methods, as well as those using standard potassium permanganate or standard perbenzoic acid, were found unsatisfactory for the determination of unsaturation in terpenes. Quantitative hydrogenation using either a platinum or a palladium catalyst furnished satisfactory results with a variety of terpenes, but not with the resin acids. High-pressure reduction was also shown to be a suitable quantitative method for terpenes.

Photoelectric colorimetric technique for the dithizone system, F. L. KOZELKA and E. F. KLUCHESKY. (Univ. Wis.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 484-487, figs. 3).—A technic adapted to photoelectric colorimeters for the determination of one component in a two-component system is described. The technic is especially adaptable to the dithizone system because it eliminates the necessity of removing the excess dithizone and the use of standard dithizone solutions. It simplifies considerably the procedure for routine analysis. Recoveries of ± 1 μ g. of lead are obtainable.

A pendulum method for measuring settling velocities, J. H. McMILLEN, L. F. STUTZMAN, and J. E. HEDRICK. (Kans. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 475-478, figs. 5).—The suspension was placed in a long tube and mounted so that the tube swung like a pendulum from a support just above the center of gravity of the suspension. As the suspended particles settled, the center of gravity of the system was lowered, causing the period of oscillation to shorten. The tube was also equipped with a second support just above the first one, and the periods of oscillation were measured for both supports. The data on these periods for various times of settling were then used to calculate the rate at which the center of gravity of the entire mixture was lowered, which gave a measure of the suspension's stability.

It was possible, by making certain simplifying assumptions regarding the nature of the settling process, to calculate also the rate at which the particles themselves were settling. The experimental results for the samples investigated agree reasonably well with the derived equations.

Platinized silica gel as a catalyst in gas analysis, K. A. KOBE and R. A. MACDONALD (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 457-459, fig. 1).—A platinized silica gel catalyst containing 0.125 percent of platinum was found to reduce the oxidation temperature of methane and carbon monoxide by approximately 100° C. below that obtained with a 0.075-percent catalyst. Temperatures for the complete oxidation of carbon monoxide, methane, ethylene, and acetylene and for the start of oxidation for ethane and propane are stated. Nitrous oxide may be reduced over the catalyst by a limited excess of hydrogen at 515°.

The catalyst tube can replace the copper oxide tube and explosion (or slow combustion) pipette in any commercial gas analysis apparatus. Large samples may be used without danger of explosion.

Removal of nitrogen oxides in semimicrodetermination of carbon and hydrogen, P. J. ELVING and W. R. McELROY. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 660-663, figs. 2).—The method used for the determination of carbon and hydrogen in nitrogen-containing compounds was improved by substituting for the lead dioxide in the combustion tube a sulfuric acid solution of potassium permanganate, or of some other oxidizing agent, placed between the absorption tubes used for water and for carbon

dioxide. Potassium permanganate and sulfuric acid are considerably cheaper and more convenient to use than other proposed nitrogen oxide absorbents which are similarly placed in the absorption train, and they are apparently equally efficient. If a method can be found for converting all the nitrogen in the sample to nitrogen oxides, the proposed method will suffice for the simultaneous determination of carbon, hydrogen, and nitrogen. An added advantage of the proposed method is that it permits the use of a simplified combustion tube filling whether or not compounds containing nitrogen are being analyzed. Various metals and metallic oxides were tested for their ability to decompose or absorb nitrogen oxides. Although some of the metallic oxides satisfactorily remove oxides of nitrogen, their use is excluded since unsatisfactory carbon and hydrogen values are obtained when they are present.

Perchloric acid oxidation of organic phosphorus in lake waters, R. J. ROBINSON (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 7, pp. 465-466*).—Perchloric acid may be used in place of digestion with sulfuric and nitric acids followed by hydrochloric acid to destroy the excess nitric acid. Excess perchloric acid causes no fading of the blue molybdenum compound, and the excess of perchloric acid, therefore, does not need to be removed.

A study of the ferric thiocyanate reaction, C. A. PETERS and C. L. FRENCH. (Mass. State Col.). (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 9, pp. 604-607, figs. 2*).—In general, the most favorable acidity is 0.01 N, larger and smaller amounts of acid giving less color. Increasing the thiocyanate overcomes the effect of higher concentrations of hydrochloric acid to lessen color intensity; also, at higher concentrations of thiocyanate less acid is needed to develop the same color intensity. Increasing the thiocyanate progressively increases the colored substance with no indication of reaching a maximum. A variation in quantity of iron, over a limited range, does not change the quantity of acid necessary for maximum color intensity. The minimum concentration of several anions which reduce the color intensity of ferric thiocyanate, within the limits of the experiments here cited, are stated in the decreasing order pyrophosphate, primary phosphate, tertiary phosphate, secondary phosphate, sulfate, chloride, and nitrate. The extraction of the red color by ether depends upon the CNS:Fe ratio, and a high ratio is necessary for iron extraction.

Determination of sulfate in the presence of chromate, W. B. MELDRUM, W. E. CADBURY, JR., and W. W. LUCASSE (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 7, pp. 456-457*).—The authors reduce coprecipitation of chromate with the sulfate as much as possible by increasing the hydrochloric acid concentration. They then fuse the weighed precipitate of sulfate and chromate with sodium carbonate, dissolve the melt, and determine the chromate iodometrically.

Use of bromate in volumetric analysis: Determination of arsenic and antimony using internal indicators at ordinary temperatures, G. F. SMITH and R. L. MAY. (Univ. Ill.). (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 7, pp. 460-461*).—The titration of trivalent arsenic and antimony in strong hydrochloric acid with potassium bromate, methyl orange, or indigo sulfonate as indicators, which requires a temperature of from 80° to 90° C., may be simplified by substituting as indicators the dyes Brilliant Ponceaux 5R, B. C. I. No. 185 (0.2 percent aqueous solution), bordeaux, B. C. I. No. 88, or naphthol blue-black, B. C. I. No. 246. These indicators permit carrying out the titration at room temperature and a wide range of HCl concentrations.

Detection of certain metals in minerals and ores: An ammonium hypophosphite fusion method, H. B. VAN VALKENBURGH and T. C. CRAWFORD (*Indus. and Engin. Chem., Analyt. Ed., 13 (1941), No. 7, pp. 459-460*).—When fused with ammonium hypophosphite many minerals and ores are decomposed, the result-

ing melt often being highly colored. The color of the melt directly, or after being treated with water or hydrogen peroxide, is the basis of tests for chromium, cobalt, columbium, manganese, molybdenum, tellurium, titanium, uranium, vanadium, and tungsten. Sodium and potassium hypophosphites are not suitable for this fusion because upon decomposition they form salts with relatively high melting points instead of the low melting acids that are obtained from the ammonium salt.

Colorimetric determination of iron with kojic acid, M. L. Moss and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 612-614, figs. 4).—Kojic acid (2-hydroxymethyl-5-hydroxy- γ -pyrone) is unique as a reagent for iron in that no organic compound previously so used is a pyrone derivative. The sensitivity is sufficient to distinguish 0.05 p. p. m. of iron from a blank in 30-cm. Nessler tubes, and is adequate for quantitative determinations, especially with blue filters in a photometer. The color is relatively stable and conforms to Beer's law over a wide range. The chief limitation of the method is the necessity of controlling the acidity. A variation between pH 5.5 and 7.0 is permissible, and this range yields an orange hue suitable for visual comparisons. These limits are much wider than those for reagents such as ferron. Maximum sensitivity is obtained if the iron concentration is between 1 and 20 p. p. m. for a cell thickness of 1 cm. The color is somewhat less intense than that formed with thiocyanate or *o*-phenanthroline, thus permitting determinations on samples higher in iron than these other methods can accommodate without dilution. The method is not applicable to samples containing aluminum, citrate, oxalate, or pyrophosphate.

Thiocyanate method for iron: A spectrophotometric study, J. T. Woods and M. G. MELLON. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 8, pp. 551-554, figs. 4).—From several hundred transmission curves the authors concluded that ammonium thiocyanate is preferable to thiocyanic acid as a color-forming reagent. Nitric acid is preferable to sulfuric or hydrochloric acid. With this acid Beer's law is followed through the pH range 1.2 to 1.5, but not in higher acidities. Many of the 57 diverse ions studied interfere. The sensitivity is increased approximately 100 percent by using a 60-percent acetone solution. This solvent also improves the stability of the color. A solution of two cobaltamine salts is an improved color standard except for slight fading after several months.

In general, the thiocyanate method is inferior to several others, especially those using *o*-phenanthroline, α, α' -bipyridyl, or mercaptoacetic acid.

Determination of lead in biological material: A mixed color dithizone method, F. L. KOZELKA and E. F. KLUCHESKY. (Univ. Wis.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 7, pp. 492-494).—A simplified mixed-color dithizone method is described. The treatment of the digest with sulfur dioxide reduces the iron, thereby preventing the decomposition of the dithizone, and it oxidizes the tin and hence inactivates one of the metals which combine with the dithizone under essentially the same conditions as lead. The method eliminates the necessity of removing the excess dithizone or preparing standard dithizone solutions. Consistent recoveries of $\pm 1 \mu\text{g.}$ of lead are obtainable.

Colorimetric determination of copper with ammonia: A spectrophotometric study, J. P. MEHLIG. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 8, pp. 533-535, figs. 2).—The concentration of the ammonium hydroxide used for dilution must be carefully controlled because the ammonia solution absorbs light. The same concentration must be used for the standards as for the unknown solutions. A 3 M solution is recommended. The color system follows Beer's law. The color is stable in diffuse light for at least 6

weeks, and the use of a series of permanent standards is possible. The color reaction may be reproduced to a high degree of precision. Of 60 common ions, only a few, especially cobaltous, nickelous, and dichromate ions, seriously interfered with the color comparison. A considerable number of others caused precipitation or turbidity, but in the course of the determination this latter group would be removed.

Titan yellow qualitative test for magnesium, E. B. and C. E. OTTO. (Univ. Maine). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 65-66).—From a study of the influence of numerous ions and of variations in the conditions of the test the authors showed that the titan yellow test, although not specific for magnesium, is useful and efficient when properly applied. It is suitable for test tube or spot plate but not reaction paper. An improved spot plate procedure is given. A pH of about 12.5 is necessary for the production of the red color. Interference may be caused by ions which undergo a similar reaction, by ions which because of their color or that of compounds formed with hydroxide mask the magnesium-titan yellow color, or by ions which keep the pH too low. Ions which interfere, however, will be removed in the usual qualitative procedure before testing for magnesium and hence cause no trouble.

A rapid versus a quantitative method for determining available magnesium in soils, W. H. GARMAN and F. G. MERKLE. (Pa. Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 1, pp. 15-25, fig. 1).—Available magnesium was determined in 170 selected soil samples by a rapid and by a quantitative procedure for the purpose of comparing the accuracy of the two methods as applied to widely different soils.

The coefficient of correlation was 0.80 ± 0.03 . For the 136 samples with less than 200 lb. per acre, r was 0.87 ± 0.02 , and for the 34 samples with 200 lb. or more per acre, r was 0.54 ± 0.09 . It was shown that the rapid method is fairly reliable in dividing soils into various levels of magnesium content and is sufficiently accurate to meet the needs for which rapid-test data are intended. In the hands of a dependable and experienced worker, it can be relied upon to divide soils into at least the four groups—low to very low, medium, high, and very high. The use of this method seems to be well within the range of chemical accuracy required to coincide with present knowledge as to availability, uptake, and need for magnesium.

A wet combustion method for determining total carbon in soils, N. A. CLARK and C. L. OGG. (Iowa State Col.). (*Soil Sci.*, 53 (1942), No. 1, pp. 27-35, fig. 1).—In the method here described, the total carbon in soils and in pure organic compounds can be determined in from 20 to 25 min. with a high degree of accuracy, avoiding the varying correction factor necessary in methods of the type devised by Schollenberger (*E. S. R.*, 58, p. 113). Oxidation of the carbon is accomplished by $K_2Cr_2O_7$ in a mixture of H_2SO_4 and H_3PO_4 . Speed of oxidation is increased by addition of H_2O_2 . The CO_2 set free is measured by collecting it in an evacuated absorption flask containing $Ba(OH)_2$ and by titrating the excess $Ba(OH)_2$ with HCl. A glycerine solution replaces mercury as the confining liquid for the CO_2 . Potassium iodide dissolved in the glycerine solution prevents the apparent increase in CO_2 when chlorides are present. Results are low, however, if the chloride content is greater than 1 percent. Carbonates are removed by boiling a solution of 5 percent H_2SO_4 with 5 percent $FeSO_4$, apparently without loss of organic carbon.

Rapid estimation of base-exchange properties of soil, A. MEHLICH. (N. C. Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 1, pp. 1-14, figs. 3).—The author reports improvements in the barium hydroxide triethanolamine acetate method already described (*E. S. R.*, 83, p. 300). Barium chloride and triethanolamine neutralized

to pH 8.2 with HCl are now substituted for the hydroxide and acetate, respectively, to correct inaccurate titration end points caused by the buffer action of acetates at low pH values.

Ammonium nitrogen and nitrate nitrogen were separately determined by the methods devised at the Connecticut [New Haven] Experiment Station (E. S. R., 77, p. 302). The exchangeable magnesium was determined by the titan yellow method in an electrophotometer, and exchangeable calcium and potassium as the oxalate and cobaltinitrite, respectively.

A rapid method for determining soil moisture, J. S. PAPADAKIS (*Soil Sci.*, 51 (1941), No. 4, pp. 279-281).—Place 50 gm. of soil in a flask marked at about 100 cc. Add tap water, shaking at the same time in order to eliminate soil air. Make up to the volume, and weigh. Subtract from this weight that of the flask made up to the same volume with water alone. The oven-dry weight of the soil is the difference multiplied by a factor determined once for each kind of soil by oven drying a sample and dividing the oven-dry weight by the afore-mentioned difference. The factor varied from 1.563 to 1.667 for 17 soils tested; it is about 2.8 for wheat grains, 3 for maize grains, 2.73 for green wheat plants, 1.623 for kaolin, 1.639 for chalk, 1.612 for sand, and 1.618 for gravel.

Methods for determining phosphate in soil extracts, I. A. BLACK (*Soil Sci.*, 51 (1941), No. 4, pp. 289-298).—Organic matter was destroyed by permanganate and the iron precipitated as ferrocyanide. Iron and manganese could be completely precipitated by ferrocyanide at pH values between 1 and 2, a degree of acidity sufficient to prevent coprecipitation of any of the phosphate. Excess of ferrocyanide was removed by a sufficient addition of a 10-percent solution of manganous sulfate. A form of the original molybdenum blue method of Denigès (E. S. R., 44, p. 611) was then followed. When large quantities of titanium were present a further modified procedure involving isolation of a phosphomolybdate precipitate and re-solution of this in ammonia before color development became necessary. The titanium caused low phosphate figures in the simpler procedure.

Spectrochemical analysis of trace elements in fertilizers: Boron, manganese, and copper, E. H. MELVIN and R. T. O'CONNOR. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 8, pp. 520-524, figs. 4).—Using the low-voltage D. C. arc and a method involving a step sector and internal standard, the authors developed a procedure for the simultaneous determination of boron, manganese, and copper in mixed fertilizers with an accuracy of about ± 5 percent. Unavoidable background was found the greatest single source of inaccuracy. Preparation of base material to correspond to the average composition of fertilizers served to avoid error due to the effect of one ion on the excitation of another. The spectrochemical procedure can be used to supplement the chemical analysis of fertilizers for primary nutrients by providing a rapid method for determining the concentration of the essential trace elements.

Spectrochemical analysis of trace elements in fertilizers: Zinc, R. T. O'CONNOR. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 597-600, figs. 2).—The author devised a method for the spectrochemical determination of zinc in mixed fertilizers and applied it to the analysis of 44 representative mixed fertilizers of known chemical composition. The method is capable of determining zinc within the limits of 0.0002 percent (2 p. p. m.) to approximately 1 percent with an accuracy within ± 5 percent, thus equaling available methods for the determination of boron, manganese, and copper. The method involves the use of plates which have been treated with a special sensitized coating. The accuracy obtained shows that these plates are sufficiently consistent to permit quantitative determinations without appreciable sacrifice of

accuracy. Comparison of the values obtained by the spectrochemical method with those obtained by chemical analysis show that, in general, the chemical values are lower than the spectrochemical values, a discrepancy previously noted in similar comparisons.

Determination of hydroxide in basic copper sulfates used as fungicides. H. BOIS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 3, pp. 766-767).—This is an adaptation of the methyl orange titration method.

Reducing power of starches and dextrans, F. F. FARLEY and R. M. HIXON. (Iowa Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 616-617, figs. 2).—A rapid ferricyanide method for determining the reducing power of starches and dextrans in which the reduced iron is measured directly by a ceric sulfate titration is presented. For starches hydrolyzed by hot or cold acid or oxidized by alkaline hypochlorite, and for raw starches and dextrans, the reducing power values by this method parallel those determined by a more time-consuming procedure. Many other modified starches, such as the "chlorinated" and "thin-boiling" types, were studied.

Determination of levulose in the presence of dextrose and sucrose: A ferricyanide method, H. C. BECKER and D. T. ENGLIS. (Univ. Ill.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 15-18, figs. 2).—The reagent used contained 50 gm. of potassium ferricyanide, 225 gm. of disodium phosphate dodecahydrate, and 150 gm. of anhydrous sodium carbonate per liter. The oxidation was made at 50° C. for 60 min. Dextrose was found to exert a small but definite reducing action, and a factor is introduced to correct for its presence. Sucrose had very little effect on the determination, and large quantities did not interfere appreciably. When the levulose present was 20 percent or more of the total reducing sugar, an average accuracy of 0.5 percent was obtained. The error increased rapidly as the ratio of levulose to total reducing sugars decreased below this value.

Role of velocity gradient in determining the cuprammonium fluidity of cellulose, C. M. CONRAD. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 8, pp. 526-533, figs. 7).—In a study of methods of expressing the results of moderately to highly anomalous solutions, such as 0.5-percent cuprammonium solutions of undeteriorated cotton cellulose, the velocity gradient at which the measurement is made was found to be an important factor. The most promising procedure for anomalous solutions consists in obtaining fluidity or viscosity readings at several velocity gradients and then interpolating the results logarithmically to some common mean velocity gradient. Methods for varying the mean velocity gradient are suggested. A mean velocity gradient of 500 sec.⁻¹ is recommended as convenient of attainment in ordinary capillary viscometers and probably representative of gradients for which results of anomalous solutions have been recorded. The adoption of a common mean velocity gradient for expression of the results of anomalous solutions will not only eliminate instrument errors but will provide a unique value for any given substance. Methods are suggested for relating this to the molecular weight.

The chemistry of menhaden oil: Component fatty acids, W. H. BALDWIN and W. B. LANHAM, JR. (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 615-616).—Methyl ester fractionation and related procedures were applied to the analysis of an oil regarded as of current importance because it is the most abundant marine oil produced on our own Atlantic coast.

Determination of peroxide values for rancidity in fish oils, M. E. STANSBY (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 627-631, figs. 2).—The author points out that, inasmuch as rancidity has the two stages (1) peroxide formation and (2) formation of the compounds giving the rancid quality from

the peroxides, the quantity of peroxide present can be proportional to the degree of rancidity only so long as the peroxides are formed from the fresh oil at a rate greater than that of their decomposition to the rancidity compounds. He shows that the empiricism of this determination can be decreased, and the reaction made more nearly quantitative and less dependent upon experimental conditions, by the addition of strong mineral acids. Several other modifications in the conventional procedures are also suggested to improve precision.

Estimation of gossypol in crude cottonseed oil, J. O. HALVERSON and F. H. SMITH. (N. C. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 46-48).—Precipitation as dianilinogossypol dipyrindine is expedited by increased temperature, by the addition of gossypol in an ether-extracted oil prepared from cottonseed meats, and by constant agitation which precipitates the gossypol in a good crystalline condition for rapid filtration and washing without appreciable loss due to dissolving. Solubility is prevented by the use of pyridine in the wash solution. The gossypol compound is prevented from adhering to the glass container by the elimination of practically all water. Recovery of added gossypol and the reproducibility of results are good.

Application of the refractometer to determination of the solids in milk products, V. D. LUDINGTON (*Milk Plant Mo.*, 30 (1941), No. 12, pp. 32-34, 64-65, figs. 5).—Experiments were conducted with normal and condensed skim milk, normal milk and cream, sugared milk and cream (60 percent sucrose added), and washed sugared cream. Results are presented graphically. It was impossible to obtain satisfactory refractive index readings on the unaltered milk or cream because of the scattering of the light by the fat globules. Clear readings could be obtained on the sugared milk or cream, but total solids could be estimated with an accuracy of only about 0.9 percent, or 0.5 percent in the case of washed cream, which is not considered sufficiently precise for commercial use. Total solids in normal or condensed skim milk could be determined with a precision of about 0.2 percent.

Composition of the ash of dry skim milk and its relation to neutralization, F. HILLIG (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 3, pp. 744-751, fig. 1).—Data are reported showing that the alkalinity of the water-soluble ash does not give a true measure of the sodium and potassium normally present in the ash. Part of the sodium added to milk as sodium lactate appears in the water-insoluble ash. The addition of calcium lactate caused an unsuspected increase in the alkalinity of the water-soluble ash. The alkalinity of the water-soluble ash, therefore, measures neither the total sodium and potassium present in milk ash itself nor the basic sodium or calcium compounds present in milk as a result of neutralization. The increase in total alkalinity above normal is, however, a good measure of the amount of such neutralizing compounds used.

Rapid method for determination of manganese in feeds, J. W. COOK. (Wash. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 48-50).—Essentially the sample is digested with nitric and perchloric acids. The insoluble residue is filtered off. The filtrate is diluted and oxidized with sodium periodate, and the permanganate formed is determined by colorimetric comparison with a standard solution of potassium permanganate of approximately the same concentration.

Determining the maturity of frozen peas: A rapid objective method, F. A. LEE. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 1, pp. 38-39).—The method proposed depends upon the determination of the specific gravity of thawed peas by means of the difference between the weight of the sample in air and the weight in a liquid, in this case a mixture

of xylene and carbon tetrachloride, the specific gravity of which is 1.000. Xylene alone can be used, but the calculations are less simple. The results showed practically the same degrees of correlation with the organoleptic tests as did those of the determination of alcohol-insoluble solids. The new method is less time consuming than are other procedures of like dependability. The following tentative standards are suggested: Fancy, sp. gr. 1.084 and lower; and standard, sp. gr. 1.085 to 1.094. Samples having a specific gravity of 1.095 and higher should be considered substandard.

A clinical method for the determination of nicotinic acid in blood and urine, E. STOTZ (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 6, pp. 1042-1046, figs. 2).—The method described is a composite of several tested methods reported in the literature. It employs an acid hydrolysis of a tungstic acid filtrate, as suggested by Pearson (*E. S. R.*, 82, p. 86), using as a coupling amine *p*-aminophenol as in the Bandier and Hald method (*E. S. R.*, 82, p. 586) in an acid phosphate solution. Color development is measured either in the spectrophotometer or photoelectric colorimeter. The technic is described in detail for blood, and the necessary adaptation to urine is noted. Data from blood analyses, including the recovery of added nicotinic acid, "demonstrate that with the procedure described (1) a perfectly straight line relation was obtained between the log of the transmission at $\lambda=400\text{ m}\mu$, and the amount of nicotinic acid; (2) that in the development of the color the reaction is 95 percent complete in 40 min., and constant from 55 to 95 min. standing in the dark; (3) that in duplicate analyses of a single specimen of blood, results are reproducible within 6 percent; and (4) that in recovery experiments where the nicotinic acid (in normal saline) is added directly to the blood, never less than a 92-percent recovery was obtained in the range 3.0 to 15.0 μg . of nicotinic acid."

Quantitative determination of dissolved oxygen: Ascorbic acid oxidase method, P. F. SHARP, D. B. HAND, and E. S. GUTHRIE. (Cornell Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 9, pp. 593-597, figs. 2).—The authors found that the dissolved oxygen content of several fluids containing organic matter can be determined quantitatively by adding reduced ascorbic acid followed by ascorbic acid oxidase. The decrease in ascorbic acid as determined by titration indicates the dissolved oxygen content. Special oxygen-analysis tubes were designed to protect the liquid from air and avoid transference of the liquid during the determination. The method gave results in good agreement, in water analysis, with those of the Winkler method. The probable error was found to be from 0.1 to 0.2 p. p. m. It was found that one analyst can easily make 30 determinations in a half day if sufficient conveniently arranged equipment is available.

The spectroscopic detection of vitamin E in the tissues of the rat, T. MOORE and K. R. RAJAGOPAL (*Biochem. Jour.*, 34 (1940), No. 3, pp. 335-342, fig. 1).—The estimation of the vitamin was complicated by possible loss due to destruction by extraction treatments, particularly treatment with alkali for digestion and saponification, and by the interference of other substances not removed if the saponification procedure was omitted. By the method used (involving digestion and saponification) vitamin E was detected in the depot fat, but not in other tissues, of rats which had received much wheat germ oil over long periods. When large doses of *dl*- α -tocopherol or its acid were given to rats over short periods no evidence of storage of the vitamin in the tissues could be obtained. In some tissues, even from rats not receiving vitamin E, unidentified substances with an absorption band near the maximum for esterified tocopherol were present.

"In a few experiments the spectroscopic data were compared with results by the colorimetric method of Emmerie and Engel.¹ In the fat deposits, in qualitative agreement with the spectroscopic results, the vitamin was only detected in significant amounts in rats which had received wheat germ. In liver the amounts of vitamin E present according to the color test showed little variation with dietary history. Comparison with the spectroscopic data suggested that in liver substances other than tocopherol may have contributed to the color reaction."

Studies of Florida and California oranges in regard to the relationship of frost damage to juice content, L. M. BEACHAM (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 3, pp. 788-793, fig. 1).—As a result of the studies conducted on Florida and California oranges it appears that a comparison between the juice content of the sound fruit in a given lot of oranges and the juice content of all the fruit present in the lot may be used for determining objectively the extent to which the lot has been injured by freezing.

Boiling-point elevation of sucrose solutions, C. J. TRESSLER, W. I. ZIMMERMAN, and C. O. WILLITS. (N. Y. State Expt. Sta.). (*Jour. Phys. Chem.*, 45 (1941), No. 8, pp. 1242-1245, fig. 1).—The authors found the boiling-point rise of 3.9° C., accepted by the maple sirup industry as showing a concentration of 11 lb. of sucrose to the gallon, not to agree with some of the recorded figures for the effect of this solute on the boiling point of water. Careful measurements showed that the values obtained for the boiling-point elevation of sucrose solutions varied considerably according to the method used in the determination. For the type of apparatus used the values presented are somewhat lower than those of other investigators, the boiling-point elevation for "standard" sirup being 3.8° C. (6.84° F.). In the actual preparation of maple sirup, deviations from this standard value may be expected, due for the most part to the fact that the thermometer is customarily read while it is dipping into the superheated boiling solution and also to the presence of certain amounts of invert sugar and substances other than sugar.

The use of Iowa clays for the clarification of sorgo sirup, W. G. GAESSLER, J. D. REID, and F. L. CUTHBERT. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 287-299).—Certain Iowa clays may be used to clarify sorgo juice for the production of sorgo sirup on the farm. Such sirup is equal to commercial products or better with regard to taste, clarity, and color. The process and a practical method of testing clays for their clarifying power is described. An exhaustive examination of two clays of very similar appearance, but of very different effect in the clarification of sorgo juice, showed that the principal difference was that the effective clarifying agent contained the clay mineral montmorillonite. Examination of a number of clays indicated that particle size was also an important factor in the practical use of the clay for clarification, since the clay must settle fairly rapidly after clarification. Clays suitable for this use are fairly widely distributed in Iowa. The loss of sirup in the clay clarification was about 6 percent. The saving in time and labor and the improved quality of the product amply compensate for this loss, however.

The fructosan content of some grasses adapted to Iowa.—A preliminary survey, A. G. NORMAN, C. P. WILSIE, and W. G. GAESSLER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 301-305).—The authors determined the fructose polysaccharides in some of the more important grass species adapted to Iowa conditions in order to ascertain whether any of these might serve as a source of fructose. In almost all samples the content was of the order of from 2 to 4 percent, which would not be sufficiently high for this purpose.

¹ Rec. Trav. Chim. Pays-Bas, 58 (1939), No. 7-8, pp. 895-902.

The largest quantity found, 7.6 percent, was in Sudan grass at the blooming stage.

Levulose from chicory, dahlias, and artichokes, E. S. HABER, W. G. GAESSLER, and R. M. HIXON. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 291-297).—From results secured in tests for 2 yr., chicory appeared to be easier and cheaper to produce from the agronomic standpoint than are the other two plants named. The moisture content, percentages of levulose, glucose, and nitrogen, and the glucose-levulose ratio as found in a considerable number of samples of each of the three crops are tabulated.

Anaerobic decomposition of wheat straw by thermophiles and the quantity of gas produced, R. P. STRAKA, G. H. NELSON, and M. LEVINE. (U. S. D. A. coop. Iowa State Col.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 3, pp. 129-144, figs. 8).—Experiments on production of fuel gases (E. S. R., 81, p. 167), pulp, and fertilizer material from straw are described. Wheat straw produced 404 cc. of gas per gram of volatile solids when the straw was finely ground, 392 cc. when the straw was chopped to one-fourth of an inch, the corresponding figures for cornstalks being 543 and 401 cc., respectively. The gas produced contained between 55 and 60 percent methane and between 2 and 2.5 percent hydrogen, the greater part of the remainder being carbon dioxide. Percentage decomposition of cellulose and pentosans was high, no indication of selective fermentation being noted. There was also appreciable break-down of lignin, but this appeared the most resistant of the three types of component named. The formation of some lignonitrogenous complexes was indicated.

Effect of metal containers on the anaerobic fermentation of cornstalk flour by thermophiles, R. P. STRAKA and G. H. NELSON. (U. S. D. A. coop. Iowa State Col.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 1, pp. 19-31, figs. 5).—The fermentations in the stainless-steel container compared favorably with those in the glass control. The quantities of gas produced in these two containers were fairly close throughout five runs. The break-down of the various constituents, although it varied more widely than did the gas produced, was approximately of the same magnitude for the two containers. The cellulose and the pentosans were broken down the most readily; the lignin was the most resistant. Less gas was generally produced from the sheet-iron than from the glass container throughout five runs, but the relative quantities of gas produced from the sheet-iron container varied considerably from run to run. Less gas was produced in the sheet-iron container than in the glass, but the break-down of the various constituents was approximately of the same magnitude for both containers. Practically no gas was produced from the copper container throughout four runs. Decreasing quantities of gas were obtained from the galvanized-iron container, and a fifth run produced practically no gas. Greater quantities of the various constituents were broken down than could be accounted for by the gas produced throughout the runs in both the copper and the galvanized-iron containers.

Relations between wheat malt dosage, flour diastatic activity, and gassing power, F. C. HILDEBRAND and W. F. GEDDES. (Minn. Expt. Sta. et al.). (*Cereal Chem.*, 17 (1940), No. 5, pp. 626-635, figs. 3).—In adding to a common base flour varying levels of malted wheat flours which differed widely in amylase activity, gas production was found to vary directly as the logarithm of the malt-flour dosage, whereas the relationship between dosage and diastatic activity was best expressed by a quadratic equation. Estimation of malt-flour activity is most conveniently and simply made by plotting cubic centimeters of CO₂ produced by blends against the logarithm of dosage and the quantity of malt flour required to produce the selected level of gas production read from the straight

line thus obtained. The relation between diastatic activity and gassing power was curvilinear, although the substrate was essentially the same throughout.

Activated carbon from certain agricultural wastes, T. R. McELHINNEY, B. M. BECKER, and P. B. JACOBS. (U. S. D. A. coop. Iowa State Col.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 227-239, figs. 3).—Carbons comparable with commercial carbons in adsorptive capacity were prepared from oat hulls, corncobs, pecan shells, and cornstalk pressboard. Figures for a carbon from straw show about three-fourths and for a carbon from rice hulls about one-half the capacity of the commercial carbons. If economically feasible, manufacture of activated carbons represents a potential outlet for utilizing large quantities of these agricultural waste materials.

Microbiology of paper containers for fluid products, E. WHEATON (*Inst. Food. Technol. Proc.*, 1 (1940), pp. 213-226, figs. 2).—Bacteriological methods for determining the sanitary quality of paper stock and finished containers and desirable bacterial standards for each are discussed. The significance of determining the presence of coliform organisms is stressed. A discussion by R. S. BREED (pp. 223-226) makes a plea for as much simplification of bacteriological methods in examining paper stock and paper containers as is consistent with reliable results.

Economic losses due to the activities of microorganisms, J. R. SANBORN and R. A. GILLOTTE. (N. Y. State Expt. Sta.). (*Paper Trade Jour.*, 112 (1941), No. 21, pp. 33-37).—The pernicious effects of micro-organisms in paper mill systems which result in slime, offensive odors, decreased production, inferior quality, and increased maintenance costs are most efficiently controlled by preventive measures, data on which are briefly presented. Thorough washups, sterilization of cleaned surfaces and equipment, and use of bacteriologically satisfactory water supplies are general precautions to follow, with specific germicides applied at points most favorable to microbial development.

The spore germination of bacteria commonly found in paper and paper products, [R. S.] BREED [*Tech. Assoc. Pulp and Paper Indus.*], *Tech. Assoc. Papers*, 23. ser., No. 1 (1940), pp. 72-73).—A discussion of the significance of spore-forming bacteria in pulp, paper, and paperboard products.

Accuracy and significance of bacterial counts from paper and paperboard, R. S. BREED and J. R. SANBORN. (N. Y. State Expt. Sta.). (*Paper Trade Jour.*, 113 (1941), No. 1, pp. 24-29, figs. 2).—Methodology, permitting a more accurate estimation of the bacterial numbers in paper and paperboard, is discussed at length.

Production of naval stores (U. S. Dept. Agr., *Misc. Pub.* 476 (1942), pp. 10, figs. 5).—This is a brief general outline of the industry, defining and explaining the term "naval stores" and briefly describing the collection and processing of the crude gum and the types of turpentine and resinous products obtained by gum distillation, steam, sulfate, and destructive-distillation processes and listing the principal uses of turpentine and the rosins so obtained.

AGRICULTURAL METEOROLOGY

Meteorology (In *Bibliography of the Virgin Islands of the United States*, edited by C. F. REID ET AL. New York: H. W. Wilson Co., 1941, pp. 131-132).—Twenty references are given.

Meteorological observations, [1941], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls.* 625-636 (1941), pp. 4 each).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1941, which shows that the mean pressure for the year was 29.997 in.; the mean temperature 48.5° F., as compared with the normal of 47.4°, highest 94° June 27, lowest -9° January 30; total precipitation 33.93 in., as compared with the normal of 43.7 in.; snowfall 42.5 in., as compared with the normal of 47.78 in.; mean cloudiness 49 percent, bright sunshine 68.2 percent; last frost in spring May 13, first in fall September 30; last snow April 17, first December 13.

American Geophysical Union endorses the median as best expression of normal precipitation, H. T. GISBORNE. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, p. 1027).

Trends in Kansas rainfall and temperature (*Kans. State Bd. Agr. Bien. Rpt.*, 32 (1939-40), pp. 137-167, figs. 8).—The following papers are included in this symposium: What the Trends Are, by G. S. Knapp (pp. 137-148); Their Significance in Crop Production, by R. I. Throckmorton (pp. 148-158) (Kans. Expt. Sta.); and Their Effect on Water Supplies, by M. H. Davison (pp. 158-167).

Measurements of the fall-velocities of water-drops and raindrops, J. O. LAWS (U. S. Dept. Agr., Soil Conserv. Serv., 1941, SCS-TP-45, pp. [3]+33, figs. 8).

Big waters on little streams, A. S. FRY (*Agr. Engin.*, 22 (1941), No. 12, pp. 424-426, figs. 5).—Results of local thunderstorms and local effects of storms of widespread hurricane type in high Appalachian valleys in North Carolina and eastern Tennessee are described. A thunderstorm of the summer of 1938 over Webb Mountain near Gatlinburg, Tenn., a storm of the same type occurring in late August of 1940 near Asheville, N. C., and a storm of hurricane origin which caused damage in the middle of the same month are chosen for detailed discussion. Scouring of cultivated lands bordering the normally small creeks and brooks along their higher parts and heavy illuviation of silt, rock, and other debris over the bottom lands were the principal forms of agricultural damage.

Stream flow records of Pennsylvania, 1940 (*Pa. Dept. Forests and Waters, Stream Flow, Recs.*, 1940, pp. 207).—Brief discussions of stream gaging, precipitation, and ground water precede the actual records which take up the bulk of the volume.

Temperature and life, O. RAHN (In *Temperature—Its Measurement and Control in Science and Industry*. New York: Reinhold Pub. Corp., 1941, pp. 409-419, figs. 5).—This paper, presented at a symposium held in New York City November 1939, under the auspices of the American Institute of Physics with the cooperation of the National Bureau of Standards, National Research Council, and other organizations, is an analytical review (19 references) and general discussion, with particular reference to the laws of thermodynamics as applied to living organisms.

On solar-constant and atmospheric temperature changes, H. ARCTOWSKI (*Mathsn. Misc. Collect.*, 101 (1941), No. 5, pp. VI+62, figs. 33).

Mathematical analysis of the significant factors in the hygrometric forecasting equation for Florida minimum temperatures, J. W. MULLIGAN (*Amer. Met. Soc. Bul.*, 22 (1941), No. 10, pp. 385-389, fig. 1).—Most previous empirical formulas developed to aid in forecasting minimum temperatures have used either the elements of temperature or hygrometric relationships. The present approach to the problem (1) attempts to use the 1:30 p. m. observational data, and (2) uses the maximum soil depth temperature at the 6-in. level as one of the elements in constructing the formula, based on the assumption that the air temperature will vary directly with that of the soil and the amount of water vapor in the air. In this formula the dew point temperature and the soil temperature at 6 in. are considered interrelated factors in determining the minimum temperature on

the ensuing morning. Using the formula developed for determining the probable minimum for each morning over a period of time, it was found that the average error would have been 2.4° F.

The influence of Lake Erie on local snows in western New York, L. W. SHERIDAN (*Amer. Met. Soc. Bul.*, 22 (1941), No. 10, pp. 393-395).—This study of the conditions accompanying numerous local snowstorms was made with the idea that the results might aid in predicting their occurrence.

Armistice Day freeze sets record damage, T. J. TALBERT. (Univ. Mo.). (*Amer. Fruit Grower*, 61 (1941), No. 11, p. 8).—A brief account of damage to Missouri orchards, among which 8-to-14-year-old apple trees suffered most.

Experimental data on the freezing of plants at the Lakeland Meteorological Laboratory, L. G. PARDUE, JR. (*Amer. Met. Soc. Bul.*, 22 (1941), No. 10, pp. 383-385, fig. 1).—This is a preliminary report on experiments with potted tomato and pepper plants and weather instruments placed at 2-, 5-, 14-, 24-, 34-, and 43-ft. levels in a steel tower set in the lowest point of a "frost pocket" of several acres extent to obtain data on critical temperatures of dormant plants under field conditions. The percentage damage to these plants ranged from 0 at minimum temperatures of 32° and 31° F. to 100 percent at 27°.

Our climate: Useful information regarding the climate between the Rocky Mountains and the Atlantic coast, with special reference to Maryland and Delaware, J. R. WEEKS (*Baltimore: Md. State Weather Serv.*, 1941, 6 ed., pp. 66, figs. 44).—This edition of the publication previously noted (E. S. R., 69, p. 177) is said to contain the first "degree day chart" (p. 18) for any State. The degree day is a unit that was developed by engineers to determine the amount of fuel required at any place for heating purposes during the cold season.

Why phenology? M. A. HUBERMAN. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 12, pp. 1007-1013).—The literature of phenology is summarized, and recent efforts are classified into three groups, viz, construction of calendars and charts without regard to meteorological factors, correlation of plant and animal activities with those factors, and application of the principles of bioclimatics based on geographic, climatic, topographic, and biologic factors. The methods of phenology are briefly described, some of the factors needed in organizing such studies are suggested, and, finally, because of the tremendous possibilities in the application of bioclimatics to numerous human and agricultural problems, it is urged that a national effort be made to develop a sound program of phenological studies as a basis for such application.

SOILS—FERTILIZERS

[**Soil and fertilizer investigations of the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1941, pp. 12-13, 28-31).—Fertilizer research is reported on the following: The production of phosphate fertilizer and hydrogen for ammonia by the substitution of steam for air in blast-furnace methods for treating phosphate rock, the development of a method of granulation of potassium chloride, and the status of the use of mixed and high analysis fertilizers, all by R. O. E. Davis.

Soil chemistry investigations are reported as follows: The boron content of different soils throughout the United States, a method for the determination of fluorine in soils, and the possibility of the use of hickory leaves as an indicator plant to determine the availability of certain trace elements, all by H. G. Byers.

Soil microbiology investigations are reported on the inoculation of winter legumes and the effect of certain minor elements on nitrogen fixation, by C. Thom.

Data on the soil surveys are reported by C. E. Kellogg.

[Soil investigations by the Georgia Station] (*Georgia Sta. Rpt. 1941, pp. 28-52, 55-59, 100-102, 110-112, 148-153, figs 4*).—Topics discussed are the acidity of Georgia soils, equivalent acidity or basicity of some common sources of nitrogen, sources of nitrogen for cotton (including pot tests on the availability of organic nitrogen), the use of limestone in mixed fertilizers, rates of potash for cotton in acid and neutral fertilizers, the use of broadcast limestone on cotton soils, fillers and supplements for cotton fertilizers, some results from the use of calcic limestone and various sources of nitrogen on a very acid Cecil sandy loam, the residual effect of nitrogen, effect of rainfall on movement of nitrates in the soil, evidence of the value of sodium in cotton fertilizers, sources of phosphorus, chemical soil tests, soil tests on pastures, and the work of the Southern Piedmont Soil and Water Conservation Experiment Station, Watkinsville, Ga.

Preliminary color standards and color names for soils, T. D. RICE, D. NICKERSON, A. M. O'NEAL, and J. THORP (*U. S. Dept. Agr., Misc. Pub. 425 (1941), pp. 12, pls. 8, figs. 6*).—Descriptive designations of 56 colors covering the range of soil colors were chosen from among the Inter-Society Color Council and National Bureau of Standards color names (noted below). They are arranged on cards pivoted at one corner and provided with openings beside each color patch to permit determining the color most nearly matching that of a given soil. The accompanying text briefly discusses the principles of the set of color names to which reference has been made and of the literal-numerical designation of colors by means of the color solid.

Central notations for ISCC-NBS color names, D. NICKERSON and S. M. NEWHALL (*U. S. D. A. et al.*). (*Jour. Opt. Soc. Amer., 31 (1941), No. 9, pp. 587-591, fig. 1*).—The authors present a condensed description of the verbal method of color designation now accepted as that of the Inter-Society Color Council and the National Bureau of Standards, and tabulates the Munsell notations of the central colors of the ranges covered by each of the respective designations. The objective aimed at was a system of color designation "sufficiently standardized to be acceptable and usable by science; sufficiently broad to be used by science, art, and industry; and sufficiently commonplace to be understood, at least in a general way, by the whole public."

The modern conception of soil and its relation to plant growth, C. O. ROST (*Greenkeeper's Rptr., 7 (1939), No. 4, pp. 5, 6, 43; abs. in Minnesota Sta. Rpt. 1941, pp. 46-47*).—The paper presents a general discussion of the modern concepts of soil formation in relation to climatic factors and the effect of these upon plant growth.

The muck soils of Michigan, their management and uses, P. M. HARMER (*Michigan Sta. Spec. Bul. 314 (1941), pp. [1]+128, figs. 76*).—This publication presents a comprehensive account of the origin, distribution, classification, management practices, and cultural treatments for the production of various crops on muck soils. The muck soil area in Michigan is considered to be at least 4,000,000 acres in extent. Many farms throughout the State have been found to have areas of muck soil. The author points out that muck farming in Michigan is in its infancy, and that the main use of muck at the present time is for the growth of special crops. The development of new areas is likely to be in connection with the production of general crops.

Muck soils are classified on the basis of the reaction of the surface soil into the three following groups: (1) Low-lime mucks (pH 4.5 or less), (2) high-lime mucks (pH 7.0 to 4.6), and (3) alkaline mucks (pH 7.1 or higher). The need of Michigan muck soils for lime is considered, with a discussion of the need for liming in connection with the production of various crops. The value of

sulfur and of manganese sulfate on alkaline muck for securing satisfactory production is given for several crops based on 15 yr. of experimental results.

Nutritional disorders in muck crops, such as cracked stem of celery, girdle of table beets, and boron deficiency of sugar beets, are reported as being directly due to lack of available boron in Michigan muck soils. Application of 25 lb. per acre of boron is suggested as generally being sufficient to correct these deficiency diseases. In some cases, however, 100 lb. per acre of borax mixed in the fertilizer and well worked into the soil may be used safely. The response to copper sulfate was found to vary with different crops. Applications of salt have been found beneficial for certain crops. The author points out that from 500 to 1,000 lb. per acre of salt in addition to the regular fertilization can be recommended for newly reclaimed muck on which celery is to be grown. An annual application of from 250 to 500 lb. per acre is suggested as being sufficient on older celery fields.

The limitations of the moisture supply of muck soils are discussed in considerable detail. Recommendations are made on systems of drainage, water table level, ditches, dams, and tile locations. The harmful effects of burning muck land during clearing operations are emphasized. Extremes in temperatures of muck soils are considered in relation to frost injury, moisture supply, lakes, air drainage, location of heaters, decomposition, and several other important factors related to crop production. General problems on the use of fertilizers for muck crops are reported in detail, with recommendations as to the use of fertilizers for specific crops.

The relative productivity of some humid subsoils, C. O. ROST. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 281-287, figs. 6; *abs. in Minnesota Sta. Rpt.* 1941, pp. 31-32).—The yield of oats on 14 soil profiles fell very rapidly from the surface downward. A nitrogen fertilizer usually remedied the unproductivity as effectively as did nitrogen and phosphate or nitrogen, phosphate, and potassium. Similar experiments with red clover and with sweet-clover are reported, the $\frac{1}{3}$ - and $\frac{1}{5}$ -ft. layers giving better yields than did the surface soil, whereas the lower layers showed decreased yields, usually remediable by phosphates or phosphates and potassium salts. On six fields with soil removed to depths varying from 5 to 25 ft. inoculated alfalfa grew satisfactorily without fertilizer treatment, although on only one field was the fertilizer entirely without effect. On the remaining five there was a slight effect.

Pasture production as affected by type and chemical composition of the soil, N. O. PRICE, W. B. ELLETT, and H. H. HILL (*Virginia Sta. Tech. Bul.* 78 (1941), pp. 14).—From analyses of soils under good and under poor sods, it is concluded that a soil should have the following percentages and milliequivalent amounts of plant nutrients present in order to produce a good pasture: Total nitrogen 0.200 percent or more, total carbon 2.50 percent or more, total phosphoric acid 0.200 percent or more, available phosphoric acid 50 lb. per acre or more, available calcium 1,000 lb. per acre or more, exchange capacity 15.0 m. e. or more, and base saturation 60.0 percent or more. The chemical analyses of the soils from the Appalachian region showed that they contain higher percentages of nitrogen, total carbon, and phosphoric acid, and are less acid than the soils from the Coastal Plain and Piedmont Plateau. The potash content of the soils was found to be present in the exchangeable form in larger quantities in those soils which produced good pastures than in those producing poor pastures. It is believed that poor pasture growth may be attributed to soil acidity, the lack of nitrogen, organic matter, phosphoric acid, and lime.

Some soil changes resulting from drainage, H. B. ROE. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 402-409, figs. 8; *abs. in Min-*

nesota Sta. Rpt. 1941, p. 44).—Studies of open-ditch drainage effects on Minnesota swamp forests show large reductions of harmful acidity and much stimulation of desirable bacterial action and of timber growth during the life of the trees. Good permeability was shown to be developed, through from 13 to 20 yr. of tile drainage, in originally tight silt and clay loam and marl soils in Minnesota and North Dakota. Total subsidence of cultivated peat in Minnesota is shown to be closely proportional to depth of drainage on an experimental tract on which the water level was controlled at various successive depths.

Biological aspects of soil fertility, W. NELSON-JONES (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 379-411, pls. 3).—A detailed account of experimental studies of the causes of infertility in a heath soil at Wareham Forest is presented.

Some factors affecting the nitrate content of an orchard soil, O. A. BRADT and G. H. DICKSON (*Sci. Agr.*, 22 (1941), No. 1, pp. 61-67, figs. 3).—Nitrate nitrogen and moisture determinations under various conditions of cultivation in an apple orchard are presented. The authors report a marked difference in the nitrate nitrogen content under different systems of cultivation. Under minimum cultivation, where seeding took place on May 15, and regular cultivation, which was seeded on July 15, there were found to be no appreciable differences in soil moisture. Cultivating the soil during May, June, and early July as compared with scraping the soil did not consistently increase or decrease the nitrate nitrogen or moisture supply.

Retention by the soil of the nitrogen of several amino acids, J. P. CONRAD. (Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 1, pp. 48-58, figs. 3).—Since protein material added to the soil is largely made up of amino acids and also since amino acids are intermediate products in the break-down of protein material, the author points out the importance of a knowledge of the break-down of amino acids in the soil.

Preheating the soil to inactivate any enzymes or other thermolabile catalysts had only a slight effect upon the ability of the soil to remove amino acids from percolating solutions. Adsorption isotherms of a number of the more soluble amino acids with preheated Yolo fine sandy loam soil showed that the dicarboxylic monoamino acids, aspartic and glutamic, were most weakly adsorbed, the monocarboxylic monoamino acids, glycine, alanine, leucine, and norleucine, were somewhat more strongly adsorbed, and the monocarboxylic amino acids with one or more nitrogen-containing radicals in addition to the α -amino radical, such as lysine, histidine, and arginine, were most strongly adsorbed—even more strongly so than the NH_4 ion of NH_4Cl . Increased adsorption of amino acids was indicated by lengthening the hydrocarbon chain in the amino acids or transferring the NH_2 radical farther out on the chain away from the carboxyl group. Replacing a hydrogen on the terminal carbon atom of the chain with a phenyl group was found to decrease adsorption, while an OH substitution increases the adsorption some and an SH substitution increases it somewhat more.

Influence of orchard soil management upon the infiltration of water and some related physical characteristics of the soil, L. Y. LI, R. D. ANTHONY, and F. G. MERKLE. (Pa. Expt. Sta.) (*Soil Sci.*, 53 (1942), No. 1, pp. 65-74, figs. 11).—Cultivation in the fall and spring with an annual cover crop of rye sown in the fall and millet in the spring permitted soil deterioration, as evidenced by a reduction in the organic content, the granule stability, and the probable permeability. A more compact, easily dispersed surface layer resulted, giving rise to poorer infiltration and greater erosion and run-off. Alfalfa sod harrowed only in the spring resulted in higher organic content, better structure, increased infiltration, and decreased run-off and erosion. A permanent bluegrass sod harrowed each spring gave the highest organic content and the greatest

structural stability and permeability in the surface 3-in. layer, resulting in excellent infiltration and almost no run-off and erosion. The cumulative effects of these treatments from 1926 to 1940 resulted in a better moisture status in the entire soil mantle where perennial cover crops were used. There was shown to be a close correlation between changes in the physical properties brought about by variations in treatment and the actual measurements of moisture infiltration, run-off, and moisture content in the profile.

Air and soil temperatures in a California date garden, D. E. BLISS, D. C. MOORE, and C. E. BREAM. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 1, pp. 55-64, figs. 4).—The temperatures of the air and of the soil at 1- and 3-ft. depths were recorded continuously by thermographs, and weekly mean temperatures were calculated from the thermograph charts by means of a planimeter. Temperatures of soil at depths of 4, 6, 7.5, and 8 ft. were determined weekly with standard thermometers. Wide seasonal variations in weekly mean air temperatures were found. During the summer months the temperatures of the air were considerably higher than those of the soil at a depth of 1 ft. The large palms which surrounded the instruments had a tempering effect on the air temperatures within the garden, but the mean weekly air temperatures were almost identical with those at a nearby meteorological station located in the open. Overturns in the temperature of the soil at different depths occurred regularly in the fall and spring of each year. The yearly range of air temperatures was considerably greater than that of soil at a depth of 1 ft.; the yearly range of soil temperatures diminished with increasing depth of soil.

Report of the Chief of the Soil Conservation Service, 1941, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt.*, 1941, pp. II+75).—This report emphasizes the role of the activities of the Soil Conservation Service during the past year in connection with the national defense effort. The defense activities have been summarized as follows: (1) Acquiring lands needed by the Army and Navy for camps, proving grounds, and other military purposes; (2) making lands available to the Army for defense purposes; (3) preparing aerial maps, drawings, blueprints, and other reproductions for defense purposes; (4) processing photographs for defense information purposes; (5) training personnel; and (6) providing various kinds of assistance in response to particular requests from defense agencies. The progress of the year is indicated by the increase in soil conservation districts from 314 at the beginning of the year to 548 at the end of the year—from an area of 190,163,351 to 332,088,660 acres. The number of districts cooperating with the Department of Agriculture almost doubled—from 224 to 439—in the same 12 mo. The specific progress in the various areas is presented by a review of the work in the several soil conservation regions of the United States. Progress on surveying and mapping, nurseries and range lands, wildlife, engineering structures and operations, stubble mulch, crops and cropping practices, pasture improvement, and several other activities related to the development of sound conservation practices is summarized. The importance of the research activities in the development of better soil conservation practices is emphasized, and some of their findings are briefly set forth.

[**Soil conservation and land use studies**] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1941, pp. 176-182).—This report takes up the great costs incurred through soil losses, the preparation of land-use-capability maps, and tillage by conservational methods. Control of floods by land treatments is also dealt with, an appraisal of benefits is made, and the national defense aspect is discussed.

Water conservation on the Great Plains, F. C. FENTON. (Kans. State Col.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 45-46, 48, figs. 5).—Conservation of rain-

fall in an area in which the subsoils are dry and plant growth must depend upon the moisture content of the top 4 or 5 ft. of soil is discussed. Basin listing is highly effective, and in some sections of the Great Plains it is an established tillage practice. It is subject to the objection that the basin-forming attachment, added to an ordinary lister, increases draft by about 25 percent, and that for weed-killing tillage either the dams must be broken out or the ridges must be split and new furrows and dams made. On the other hand, a high degree of effectiveness is indicated by such examples as that of a basin-listed field at the Fort Hays Substation which held all of a rainfall of 2.5 in. in 30 min. on a 4-percent slope, while ordinary listing held less than one-half of this rainfall. At the Colby Substation basin listing resulted in 20-in. penetration as against 10-in. penetration on an unlisted field. The value of terracing and contour farming, strip cropping, and pasture furrows on contour are also noted. The value of storage ponds is emphasized, and the construction of many is noted. It is pointed out, however, that evaporation rates (in 1934, 70.5 in. at Garden City and 66 in. at Hays) are such as to require deep ponds for holding water through dry periods. A rule of current application is that of a depth equal to twice the annual evaporation loss.

Soil conservation in Puerto Rico and the Virgin Islands of the United States: A handbook (U. S. Dept. Agr., *Soil Conserv. Serv.*, 1941, *Region 2*, pp. 141, figs. 39).—A comprehensive handbook of possible methods that may be employed in conserving the soils of Puerto Rico and the Virgin Islands.

Soil erosion in China, T. M. TIEH (*Geog. Rev.*, 31 (1941), No. 4, pp. 570-590, figs. 17).—The subject is discussed as to climate, soils, and vegetative cover, and the extent of soil erosion and its control.

Dispersion studies on Gezira soil, T. N. JEWITT (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 466-478, figs. 5).—The relation of initial moisture content to the degree of dispersion on shaking of the heavy clay Gezira soil is given. A minimum dispersibility was found at about 7 percent of initial moisture content. The relation between dispersion and water content is discussed in connection with possible effects in field practice.

A private land rehabilitation and soil conservation program, G. B. DEWESE (*Agr. Engin.*, 22 (1941), No. 9, pp. 327-328).—The author describes measures of the usual type taken by a life insurance company to control sand and water erosion, to conserve moisture, and to improve fertility on farms securing agricultural loans. A number of instances of marked increase in the operator's returns from the farm resulting from such land improvements are noted. The company cooperates in the establishment of conservation districts.

Application of the erosion equation to strip crop planning, R. W. GERDEL and R. E. ALLEN. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 59-61, 64, figs. 5).—An erosion equation by which the expected soil loss from any given cultivated strip in a strip-cropped field may be calculated for a large number of soil types in the Ohio Valley region is given in the form $X=C.S^m$, in which X represents soil loss in tons per acre from any given cultivated strip, C a constant or variation for soil group or soil type based upon erodibility, S is slope of the watershed in percentage, and m is an exponent which varies by length of watershed. Plotting the values for m against length of watershed produced a tangent curve with the center of moment about the values $m=1.91$; length=250 ft. The equation for this curve is

$$m=1.91+0.61 \left[\text{arc tan} \left(\frac{L-250}{100} \right) \right].$$

making a determination of m simply a matter of the insertion of the length of the watershed. Use of this equation and selection of arbitrary maximum soil

losses permits the determination of placement of diversion ditches on long slopes which are to be strip cropped. It is believed probable that this erosion equation, with only slight modification, can be applied to a considerable area of the country. For practical use, suitable charts or tables may be prepared from the basic equation.

The design of plot experiments for measurement of run-off and erosion, A. E. BRANDT. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 12, pp. 429-432, 436).—In this factorially arranged control plot experiment, the main effects of the three variables are measured with the same precision as though the entire experiment had been devoted to each, and the possible interactions between them are measured with full precision. "If a research worker should attempt to answer all of these questions by letting but one factor vary at a time he would be lost in a maze of experiments." The principles involved in the design of such an experiment and the successive steps of its development are discussed in some detail.

Surface run-off and erosion from permanent pastures in southwest Virginia as influenced by applications of triple superphosphate, W. H. DICKERSON, JR., and H. T. ROGERS (*Virginia Sta. Tech. Bul.* 77 (1941), pp. 26, figs. 13).—The investigations reported cover data on soil and water losses from representative unimproved permanent pastures in southwest Virginia and the effect of pasture improvement through the use of triple superphosphate on soil and water losses. Rainfall characteristics, type and density of vegetative cover, and various soil properties were investigated to evaluate the effects produced. Soil and water losses are reported for several different locations under different degrees of slope for the Dunmore and Westmoreland soils. Soil loss from pasture plats was small, although the improvement in vegetation was accompanied by a significant reduction in the amount of soil removed by run-off. There was less erosion from the fertilized than from the untreated areas. Run-off from phosphated sods contained twice as much phosphorus as that from untreated areas. Changes in vegetation which were brought about by phosphating had no effect on water losses. It is pointed out that 7 of the 12 fertilized plats gave less run-off than the adjacent untreated plats, but that 5 other fertilized areas yielded more run-off than corresponding unfertilized areas. Areas with relatively good vegetative cover were found to lose between 10 and 20 percent of the rainfall as run-off during seasons which were followed by periods of insufficient moisture for producing good pasturage. Degree of slope of land and amount of run-off showed no definite relationship. There was no evidence of excessive soil loss on slopes up to 40 or 50 percent where a fair density of vegetative cover was maintained on the two soil types under study.

The effect of mulching and methods of cultivation on run-off and erosion from Muskingum silt loam, H. L. BORST and R. WOODBURN. (U. S. D. A. and Ohio Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 1, pp. 19-22, figs. 2).—It was found that approximately the same degree of erosion control was afforded by mulches supported 1 in. above a sealed plat as on the surface. Elimination of raindrop impact, with its destructive effect on the soil surface, rather than the reduction of overland flow velocity appeared, therefore, to be the major contribution of the mulch. Soil concentration in the run-off increased sixfold when supported mulch was quickly removed during a run.

The effect of cultivation on erosion from a bare surface was measured by preparing plats at their moisture levels—rather damp, dry, and optimum for fine cultivation. The soil prepared at optimum moisture content sealed earlier than the others and suffered both the greatest run-off and the highest average soil loss. The dusty plats also had high run-off and soil loss. The average

run-off from the three plats, cultivated damp and left cloddy, was only 25 percent, and erosion was about one-fifth of that from the plats cultivated at optimum moisture content.

Dynamics of water erosion on land-surfaces, L. SCHIFF and R. E. YODER. (U. S. D. A. and Ohio Expt. Sta.). (*Amer. Geophys. Union Trans.*, 22 (1941), pt. 2, pp. 287-298, figs. 3).—This paper covers a discussion of the factors involved in the surface movements of water on a watershed, the forces exerted by these water movements, the physical processes of erosion resulting from the forces, and the resistance of soil and vegetation to the movements and forces. Results and field observations from several workers are presented to emphasize certain important factors.

Crops and dams protect a watershed, E. WOLFE. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 62-64, figs. 4).—A conservation and flood-control project in the McGregor watershed of 2,250 acres in northeastern Iowa, bordering the Mississippi River, is reported upon. The town is subject to frequent flood damage, and gully erosion on farms in the watershed has become serious, the cultivated land having lost about 60 percent of its topsoil, leaving a mixture of topsoil and subsoil which is easily eroded and has not the water-holding capacity of the original surface layer. Soil-saving crops and detention dams have been made the primary defensive measures. Some further work desirable to enhance the protection of the watershed is discussed.

A study of factors affecting the stability of soil aggregates, C. O. ROST and C. A. ROWLES. (Minn. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 421-433, figs. 5; *abs. in Minnesota Sta. Rpt. 1941*, pp. 32-33).—It was found that the dispersion and erosion ratios qualitatively separated soils differing markedly in erodibility into two groups. The erosion ratio served the better as an index for classifying the soils. Cultivation of the forest soils made them more susceptible to erosion than they were in their natural condition by increasing the amount of silt and clay which would disperse in water. Cultivation was found to have produced little change in dispersion in prairie soils. Under Minnesota conditions the results indicate that cultivated soils with dispersion and erosion ratios of less than 19 may be expected to be resistant to erosion and that those with dispersion ratios greater than 19 and erosion ratios greater than 30 will be susceptible to erosion. In uncultivated soils the separation is not as clear, but it would appear that if an uncultivated soil had an erosion ratio of more than 20 it would be susceptible to erosion when cultivated. A number of other observations relating to aggregation and erodibility are recorded.

Laboratory experiments on evaporation from fallow soil, H. L. PENMAN (*Jour. Agr. Sci. [England]*, 31 (1941), No. 4, pp. 454-465, figs. 3).—Evaporation from freely drained soils is considered in relation to the following conditions: (1) Isothermal conditions, in which, apart from surface cooling produced by evaporation, the soil is kept at air temperature; (2) evaporation under simulated summer field conditions, in which the soil surface is maintained at a higher temperature than the air for part of the day; and (3) the effect of dissolved salt in the soil water under both isothermal and nonisothermal conditions.

Leaf analysis and plant nutrition, G. W. CHAPMAN (*Soil. Sci.*, 52 (1941), No. 1, pp. 63-81, fig. 1).—After drying of the leaves selected for analysis the midribs were removed and the material was ground to pass a 40-mesh screen. Nitrogen was determined by a micromethod. Ashing for potassium and phosphate determinations was done in stainless steel dishes at barely red heat. Phosphate was determined by a molybdate colorimetric method and potassium by a rapid cobaltinitrite method.

From the results of a series of field experiments, the leaf composition and growth rate of seedling rubber are shown to be correlated. In mature rubber, similar relations exist. Latex yield is shown to be correlated especially with leaf nitrogen, and under certain conditions both are depressed by phosphatic fertilization. The effect of phosphates on the penetration of ammonia nitrogen into the soil is shown to be very marked. This is held to support the theory that the depression of nitrogen absorption by phosphatic fertilization is primarily a soil phenomenon.

Applying fertilizer in liquid form, V. A. TIEDJENS. (N. J. Expt. Stas.). (*Agr. Engin.*, 22 (1941), No. 12, pp. 440, 442).—Fertilizers in solution are likely to be more quickly available than when in solid form, especially when soil moisture is inadequate, and less wasteful, especially with respect to phosphates, of which more than the actual plant requirement is usually applied because of the low solubility of the phosphate in dry fertilizers; local excess concentrations and consequent burning can be avoided more readily with dissolved than with solid fertilizers; and uniform application of small quantities of the materials of poor physical characteristics (as stickiness) is easier. On the other hand, dissolved fertilizer salts can not contain much calcium and magnesium and will render the soil acid unless pulverized limestone is freely used; and excess must be avoided as with fertilizer applied in the solid form. Examples of striking economies coupled with markedly increased yields are noted.

The effect of certain nitrogenous fertilizers on the chemical and vegetative composition and yield of pasture plants, J. F. EHEART and W. B. ELLETT (*Virginia Sta. Tech. Bul.* 75 (1941), pp. 44, figs. 6).—In 9 years' tests on hay and grass plats with sodium nitrate, ammonium sulfate, and urea as sources of nitrogen, 200 lb. (one-half in April, one-half in July) of the nitrate nitrogen gave a greater increase in total quantity of grass dry matter and protein and in protein percentage than did the other two nitrogen sources. The results obtained in the experiments with ammonium sulfate and urea were insignificant. In hay, all three sources gave large increases, that from the urea being somewhat the greatest. Sodium nitrate gave the largest increase in ether extract and in crude fiber at an early cutting. Sodium nitrate and ammonium sulfate increased total digestible nutrient content more than did urea. All three sources of nitrogen decreased the percentage of clover and increased that of bluegrass. From a practical viewpoint, however, it was concluded that no significant improvement in composition or increase in yield of pasture vegetation was obtained from 50 lb. of nitrogen per acre from any of the three sources, and that the increases obtained from the larger dosages were not sufficient to pay their cost.

Delta fertilizer studies emphasize need for nitrogen, R. KUYKENDALL (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942) No. 1, pp. 1, 8).—Effects of nitrogenous fertilizer on the cotton crops when applied for some years from various sources and on various soil types are tabulated, and some of the general tendencies are indicated.

The determination of the total fixed nitrogen content of power plant flue gases, O. R. SWEENEY, F. E. CAMPBELL, and B. JONES. (*Iowa State Col.*). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 207–210).—Pointing out that if all the fixed nitrogen in the coal burned annually could be recovered as ammonium sulfate it would amount to 32 million tons, or as sodium nitrate 40.5 million tons, the authors report analyses of flue gases from two boiler-heating furnaces, any nitrogen oxides in the gas samples having been reduced and the total combined nitrogen determined as ammonia. When the heating plants were operating at the higher temperatures the combined nitrogen of the flue gases decreased as the gases passed through the stack. This did not occur at the lower operating tem-

peratures. In no instance did the combined nitrogen exceed 0.1085 percent of the total available in the coal.

The use of radioactive elements for soil and fertilizer studies, W. J. HENDERSON and U. S. JONES. (Purdue Univ.). (*Soil Sci.*, 51 (1941), No. 4, pp. 283-288, figs. 4).—The fixation of phosphorus by Cecil clay, Bedford silt loam, Newton sandy loam, and Crosby silt loam was investigated by the use of the radioactive isotope. When $\text{Ca}(\text{H}_2\text{PO}_4)_2$ containing radioactivated phosphorus was applied to the surface of the soil and washed down with water equivalent to a precipitation of $2\frac{1}{2}$ in. the penetration of the phosphorus ranged from $1\frac{1}{4}$ in. for Cecil clay to about 4 in. for Crosby silt loam. The addition of KCl caused the radioactive phosphorus to penetrate more deeply, but $(\text{NH}_4)_2\text{SO}_4$ had no immediate effect. The radioactive technic was used to study the movement of potassium in Bedford silt loam. It was found that not more than 5 percent of the KCl applied penetrated beyond $1\frac{5}{8}$ in. with a water treatment equivalent to $2\frac{1}{2}$ in. of rainfall. The radioactive technic appeared to offer a valuable method for studying the behavior of ions in soils.

Phosphate applied in narrow bands for better results, R. COLEMAN (*Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 1, p. 7).—Placing the phosphate 2.5 in. to the side and 2 in. below the seed either in narrow bands or by hill dropping gave much better results for cotton than did any less concentrated placement in experiments, 1939-41. A badly eroded Atwood sandy loam was used in the 1939 test, and Paden silt loam in those of 1940 and 1941.

Evidence in support of a new concept as to the end product of superphosphate in limed soils, W. H. MACINTIRE and B. W. HATCHER. (Tenn. Expt. Sta. et al.). (*Soil Sci.*, 53 (1942), No. 1, pp. 43-54).—The conclusions detailed are very similar to those already noted in Tennessee Station Bulletin 176 (E. S. R., 85, p. 593). Supporting evidence from experiments with calcium fluoride introduced in quantities equivalent to the usual calcium silicate slag treatments is added. These increments of fluorides did not repress the uptake of P_2O_5 supplied as dicalcium phosphate, but they repressed substantially the uptake from corresponding incorporations of tricalcium phosphate. It is concluded that any superphosphate not "fixed" and not used by the plant in a preliminary soil will suffer ultimate reversion to the fluorophosphate that characterizes raw rock. "Although the formation of this ultimate phosphatic compound in mixtures outside the soil has been demonstrated and indicated by plant cultures as occurring within limed and phosphated soils, the extent to which the phenomenon may become of practical importance is to be established."

Phosphorus fixation by soil separates and fractions, A. T. PERKINS, C. E. WAGONER, and H. H. KING. (Kans. Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 1, pp. 37-41).—Phosphate fixation was studied in separates and fractions of a Wabash soil ranging from fine sand to clay and obtained by sedimentation and bromoform flotation. Both the chemical composition of the soil minerals and the phosphate fixation were found related to particle size. As the particle size decreased, the $\text{SiO}_2/\text{R}_2\text{O}_3$ ratio decreased and phosphate fixation decreased on a surface area basis but increased on a weight basis. These changes were gradual, until at a diameter of 0.006 mm. there was an abrupt change in the characteristics of the soil particles.

Phosphorus fixation in relation to the iron and aluminum of the soil, W. H. METZGER. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 12, pp. 1093-1099, fig. 1).—This article presents further evidence indicating that the relatively easily extractable iron and aluminum play an important role in phosphorus fixation. Based upon results from a previous paper (E. S. R., 84, p. 301), as well as on the results of the current investigation, the author concludes

that the phosphorus-fixing capacity under field conditions of acid soils of the Prairie group, and probably other groups of acid soils as well, can be very largely accounted for by precipitation phenomena, while fixation at particle surfaces in a replaceable form is of slight practical significance.

Determination and behavior of ferrous iron in soils, V. IGNATIEFF (*Soil Sci.*, 51 (1941), No. 4, pp. 249-263).—Extraction of ferrous iron without reduction of ferric iron to the ferrous state was shown to be accomplished by the use of 3 percent aluminum chloride solution. Of the ferrous iron present in a glei soil, this reagent extracted 80 percent in the first, 12 percent in the second, and 4 percent in the third extraction. Two more extractions removed 2 percent each. Determination of the extracted iron was made colorimetrically by means of the red dipyriddy complex. The determination had to be completed in the field. Large percentages of change in ferrous iron content took place from the time of sampling to that of a second determination in the laboratory 48 hr. later. Most samples lost ferrous iron by oxidation, but a very moist peat showed reduction of ferric to ferrous iron.

By the use of this method it was found that well-drained, healthy soils investigated contained very small quantities of ferrous iron. In some samples the presence of the divalent iron was not detected. Under waterlogged conditions large quantities of ferrous iron were produced rapidly, after an initial lag of 2 or 3 days. This is mainly a biological process. The soil ferrous iron is not readily brought into solution by water, but by the use of salts the ferrous iron can be displaced from the soil. Aluminum chloride proved to be the most efficacious for this purpose. This would indicate that ferrous iron enters into the base-exchange complex of soil. Under anaerobic conditions soil water could bring into solution quantities of ferrous iron, but much larger amounts of the divalent iron were held by the soil base-exchange complex. The Eh values indicate that the activity of the reducing agents present in waterlogged soil is greater than the reductive activity of ferrous iron. Ferrous iron in soil becomes readily oxidized if aeration of the soil is improved. Ferrous iron is formed when soil is steam sterilized, and some of this divalent iron persists in the soil for a considerable length of time. Sunlight facilitates the reduction of iron in some soils and soil extracts. There is a possibility that iron acts as a catalyst, and sunlight as a source of energy in the oxidation processes in soils.

Inspection and analysis of commercial fertilizers, B. D. CLOANINGER (*South Carolina Sta. Bul.* 336 (1941), pp. 177, figs. 4).—The 1940-41 inspection data are presented, with the customary analyses.

AGRICULTURAL BOTANY

Standardized plant names (Harrisburg, Pa.: J. Horace McFarland Co., 1942, 2. ed., rev. and enl., pp. XVI+675).—This revised edition (E. S. R., 53, p. 122) is discussed editorially on page 722.

Abstracts of the papers presented before the Pacific section of the Botanical Society of America, Seattle, Washington, June 18 to 21, 1941 (Amer. Jour. Bot., 28 (1941), No. 8, pp. 726-731).—The following are of interest to agricultural botany: Cytological Studies on the Carotene in the Root of *Daucus carota*, by T. E. Weier (p. 726) (Univ. Calif.); An Hereditary Variegation in Tomatoes Associated With Sterility, by J. W. and M. M. Lesley (p. 727) (Calif. Citrus Expt. Sta.); Natural and Experimental Polyploidy in *Solanum douglasii* Dunal and Its Relatives, by E. F. Paddock (p. 727) (Univ. Calif.); Anatomy of the Lima Bean, by R. S. Snell and L. H. Pollard (pp. 727-728) (Utah State Agr. Col.); Physiological Effects of Ethylene Chlorohydrin on Germination of Potato

Tubers, by H. D. Michener (p. 728); Development of the Vascular Network in the Node of *Ricinus communis*, by M. E. Reynolds (p. 728) (Univ. Calif.); Influence of Certain Desert Shrubs on the Occurrence of Annual Plants, by F. W. Went (p. 729); and Germination of California Native Seeds, by C. B. Wolf (p. 729).

Entering a new epoch, N. I. VAVILOV (*Chron. Bot.*, 6 (1941), No. 19-20, pp. 433-437).—This is a reprint from the chapter entitled The New Systematics of Cultivated Plants from the book previously noted (E. S. R., 83, p. 595).

The economic importance of seaweeds, L. B. MOORE (*New Zeal. Dept. Sci. and Indus. Res. Bul.* 85 (1941), pp. 40, figs. 19).—Following a general introductory section, the subject matter is taken up under uses of seaweeds (for manure, food, as sources of potash, iodine, agar, etc.), and New Zealand seaweeds of potential economic importance, with a key to the brown algae of that region. A glossary and 31 references are included.

Three new species of Muhlenbergia, C. O. GOODING (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 12, pp. 504-506).

Species Batorum: The genus Rubus in North America.—IV, Verotriviales, L. H. BAILEY (*Gentes Herbarum*, 5 (1941), No. 4, pp. 199-228, figs. 14).—Technical descriptions are presented of a number of species of *Rubus* occurring in North America north of Mexico (E. S. R., 86, p. 301).

Effects of certain micro-ecological factors on the germinability and early development of Eurotia lanata, J. W. HILTON (*Northwest Sci.*, 15 (1941), No. 4, pp. 86-92, figs. 3).—Many desert ranges of the United States are rapidly becoming denuded of their usable forage plants. Of considerable import among them is *E. lanata*, the stability of which is seriously threatened in many areas. An understanding of the basic function of the factors influencing germination is essential to eventual restoration of this valuable forage plant. Toward this end studies are briefly reported on such factors as imbibition, effect of storage on seed, dormancy, temperature extremes and optimums, salt effects, early root development, and effects of bracts and pericarp on germinability.

Bibliography of the botany of New York State, 1751-1940, I, H. D. HOUSE (*N. Y. State Mus. Bul.* 328 (1942), pp. 174).

A checklist of plants in the Washington-Baltimore area, F. J. HERMANN (*Washington, D. C.: Conf. Dist. Flora, 1941*, pp. [1]+114).—This check list, containing about 2,170 species, varieties, and forms, is intended as an aid in the preparation of a new flora of this area to replace the now out-of-print flora previously noted (E. S. R., 42, p. 223).

Nuevas especies de leguminosas sudamericanas [New species of South American legumes], A. BURKART (*Darwiniana*, 5 (1941), pp. 57-73, figs. 5).

Rasgos principales de fitogeografía argentina [Principal features of Argentine phytogeography], J. FRENGUELLI (*Rev. Mus. La Plata, n. ser.*, 3 (1941), *Bot.*, No. 13, pp. 65-181, pls. 58, figs. 3, map 1).—A monograph with six-page bibliography.

Comportamiento fenológico de las plantas perennes cultivadas en la región de la Ciudad de Buenos Aires.—Observaciones del año 1940 [Phenological behavior of perennial plants cultivated in the vicinity of Buenos Aires.—Observations of 1940], A. L. DE FINA and E. C. CLOS (*Darwiniana*, 5 (1941), pp. 279-298, figs. 2; *Eng. abs.*, pp. 296-298).—About 450 species in not less than 104 families of perennials are said to be grown in this region, most of them introduced. Data on the dates of leaf fall, flowering, and fruit maturity are presented.

La vegetación de la provincia de Santa Fe (R. A.), A. E. RAGONESE (*Darwiniana*, 5 (1941), pp. 369-416, pls. 12, figs. 3).—This presents the results of

an ecological study of the Argentine Province of Santa Fe, with check list of species by plant families.

Recursos naturales del reino vegetal en Bolivia [Natural plant resources of Bolivia], M. CÁRDENAS (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 404-406).—A brief summary.

Aspecto general de la vegetación de Bolivia [General aspects of Bolivian vegetation], M. CÁRDENAS (*Chron. Bot.*, 6 (1941), No. 19-20, pp. 452-454).

Über zwei terpenführende Lauraceen Nordbrasilien [Two terpene-yielding species of the Lauraceae in northern Brazil], P. VON LUETZELBURG (*Angew. Bot.*, 22 (1940), No. 3, pp. 191-200, figs. 2).—On *Ocotea barcellensis* and *Aniba rosaeodora*.

The natural resources of Costa Rica, A. F. SKUTCH (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 399-402).—A brief summary, with special reference to agricultural crops, timber, and fiber and medicinal plants.

The vegetation of Ecuador, a brief review, H. K. SVENSON (*Chron. Bot.*, 6 (1941), No. 19-20, pp. 446-448, fig. 1).

Plant resources of Guatemala, W. POPENOE (*Chron. Bot.*, 7 (1942), No. 1, pp. 16-19).

The vegetation of the Guianas, a brief review, A. C. SMITH (*Chron. Bot.*, 6 (1941), No. 19-20, pp. 449-452, fig. 1).

The vegetation of Honduras, a brief review, T. G. YUNCKER (*Chron. Bot.*, 7 (1942), No. 1, pp. 26-27).

The vegetation of the Lesser Antilles, a brief review, W. H. HODGE. (Mass. State Col.). (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 402-404, figs. 2).

The phytogeography of Peru, L. WILLIAMS (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 406-410, fig. 1).—A brief conspectus of the vegetation of the coast, Sierra, and eastern slopes, with a summary of botanical explorations in Peru.

La vegetación del Uruguay [The vegetation of Uruguay], B. ROSENGUETT GURVICH (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 410-411).—A brief summary of the ecological zones and their constituents.

Recursos vegetales del Uruguay [The plant resources of Uruguay], A. BOERGER (*Chron. Bot.*, 7 (1942), No. 1, pp. 27-29).

Medical mycology in Latin America, C. W. EMMONS (*Chron. Bot.*, 7 (1942), No. 1, pp. 15-16).—A review with partial bibliography.

New or little known Ascomycetes collected in São Paulo in 1936, A. E. JENKINS, H. P. KRUG, and E. K. CASH. (U. S. D. A. et al.). (*Mycologia*, 33 (1941), No. 4, pp. 390-404, figs. 3).

Uredinales of New Guinea, IV, G. B. CUMMINS. (Ind. Expt. Sta.). (*Mycologia*, 33 (1941), No. 4, pp. 380-389, figs. 14).—This installment (E. S. R., 85, p. 315) contains much new taxonomy among the genera of rust fungi.

A study of root-nodule bacteria of certain leguminous plants, S. S. POSADAS (*Philippine Agr.*, 30 (1941), No. 3, pp. 215-226, fig. 1).—Strains of *Rhizobium leguminosarum* from *Crotalaria juncea*, *C. usaramoensis*, *Pueraria javanica*, *Tephrosia candida*, and *T. noctiflora* were isolated, and their morphology, cultural characters, and physiology were studied and compared.

Mutability of nodule bacteria, N. A. KRASSILNIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 1, pp. 75-76).—After a prolonged culture in filtrates of *Rhizobium trifolii*, the nodule bacteria of vetch, pea, alfalfa, and bean acquired the ability to infect clover and to form nodules on its roots. Fermentative, but not cultural or morphological, changes were also significantly affected in this way.

Liebig and the organic nutrition of plants, H. R. KRAYBILL. (Ind. Expt. Sta.). (*Amer. Fert.*, 94 (1941), No. 8, pp. 5-7, 24, 26).—A fuller account of the historical paper previously noted (E. S. R., 84, p. 448).

Simultaneous formation of a β -gentiobioside and a β -glucoside in gladiolus corms treated with chemicals, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 163-166).—"Condensation of ethylene chlorohydrin with *d*-glucose to form the β -glucoside and formation of the β -gentiobioside from absorbed *o*-chlorophenol took place in gladiolus corms even when the chemical treatments were carried out under conditions involving the simultaneous production of the two glycosides. No evidence was obtained for the formation of either β -2-chloroethyl-gentiobioside or β -*o*-chlorophenyl-*d*-glucoside."

Fate of chloral hydrate absorbed by growing plants of *Lagenaria leucantha*, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 167-169).—*L. leucantha* plants were shown to form β -2,2,2-trichloroethyl-*d*-glucoside when grown in a medium containing chloral hydrate.

Atropine transference from stock (*Datura stramonium*) to scion (*Solanum lycopersicum*), S. J. KRAJEVOJ and I. NECHAEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 1, pp. 69-71, figs. 2).—Atropine was found to pass from jimson weed stock to tomato scion.

Succinic acid as a metabolite in plant tissues, G. W. PUCHER and H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 771-783, fig. 1).—"Succinic acid is shown to be present in a number of normal plant tissues, although the proportion found was in all cases considerably less than 1 percent of the dry weight. As compared with malic, oxalic, or citric acid, it is a minor acid constituent. A study was made of the behavior of succinic acid during the development of the tobacco plant. The extensive changes in amount and in concentration that this substance undergoes indicate that it may be regarded as one of the more active metabolites of the tissues. . . . The observations show that one more of the acids concerned in this scheme of reactions is widely distributed in plants, and that the changes in amount present, at different stages of growth of the tobacco plant, are such as to suggest that succinic acid is involved in the reactions that take place within the cells. This behavior is to be anticipated if some such cyclic series of chemical reactions does indeed lie at the basis of one of the fundamental physiological functions of plant cells."

Transformation of sugars in excised barley shoots, R. M. MCCREARY and W. Z. HASSID. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 599-610, figs. 2).—Sucrose can be synthesized in barley plants when any one of glucose, fructose, mannose, galactose, maltose, or lactose is supplied. The plants thus apparently possess mechanisms to convert monosaccharides into glucose or fructose and to hydrolyze disaccharides into their monosaccharides, which are then used for sucrose synthesis. Sucrose synthesis from monosaccharides can take place in etiolated plants in darkness, showing the process to be independent of light and chlorophyll. Arabinose, xylose, mannitol, and sorbitol, and gluconic and pyruvic acids were not utilized by the plant for sucrose formation. After respiring for 24 hr. the sucrose in excised barley shoots gradually diminished, apparently due to hydrolysis, but the reducing sugars remained at about a constant level throughout that period. It was only after the sucrose was entirely depleted that a diminution in the reducing sugars could be detected. It was also shown that an excess of reducing sugars induces synthesis of sucrose, whereas an excess of sucrose favors the reverse process of hydrolysis. Sucrose synthesis did not occur without the presence of O_2 , indicating this process to be aerobic. There are 14 references.

Further growth experiments with fluorescent dyes, J. SELLEI (*Growth*, 5 (1941), No. 1, pp. 27-52, figs. 11).—As previously shown,² plant growth can be

² *Growth*, 4 (1940), No. 2, pp. 145-156, figs. 6.

increased by various dyes. The effect of fluorescent dyes was found to depend mainly on the amounts and concentration. Highly diluted and applied under proper conditions of soil, weather, light, and planting and in proper concentrations, they stimulated plant growth, making roots, foliage, flowers, and crop sturdier and more abundant. In most cases, treated plants were also improved in quality. Highly diluted fluorescent dyes can also show favorable results when used together with other plant stimulants. Concentrated dyes inhibited growth without toxic effects, since the dwarfed plants bore flowers and fruit. Methods were worked out to determine the optimum dye concentration under different plant growth conditions.

Current approaches to the plant hormone problem, G. S. AVERY, JR. (*Collect. Net*, 16 (1941), No. 3, pp. 45, 47-50).

Ein neues Verfahren der Wuchsstoffstimulation [A new method of stimulation by growth substances], H. U. AMLONG and G. NAUNDOERF (*Ber. Deut. Bot. Gesell.*, 59 (1941), No. 1, pp. 32-44, pl. 1, fig. 1).—When roots of *Vicia faba* were immersed for 3-24 hr. in 0.001 M solutions of K- α -naphthylacetate or K- β -indolylacetate and then left for further growth in sawdust, they showed after 10 days a considerable increase in lateral roots over the untreated controls. For K- α -naphthylacetate a 6-hr. immersion proved to be optimum. By immersing the roots of young plants in growth substance solutions, increased yields were obtained in field tests with tobacco and six members of the cabbage family, and increases in the number of blooms on pansies reached as high as 65 percent. Of ascorbic acid and the two above substances tested, the first acted most positively, in every case giving an increased yield, whereas the other substances—and especially the K- α -naphthylacetate (probably due to the higher dosage)—occasionally caused inhibitions. The combination K- α -naphthylacetate+ascorbic acid was less active than either constituent alone. On the contrary, the mixture 1/2000 M ascorbic acid+1/2000 M K- β -indolylacetate+1/5000 M vitamin B₁ far surpassed all other substances tested.

Estudios de fisiología vegetal.—I, Accion de la insulina sobre la celula vegetal [Plant physiological studies.—I, The action of insulin on plant cells], F. VILLAGRAN PRADO (*An. Inst. Biol. [Univ. Nac. Mex.]*, 12 (1941), No. 1, pp. 43-48; *Eng. abs.*, p. 48).—Insulin solutions are reported to have caused marked activation of the germination process in seeds of bean and wheat, an increase in the development of the bacteria and yeasts from "aguamiel" (from which pulque is made), and to have been responsible for the absence of flowers on otherwise normal bean plants from treated seeds.

Chemical stimulation of ovule development and its possible relation to parthenogenesis, J. VAN OVERBEEK, M. E. CONKLIN, and A. F. BLAKESLEE (*Amer. Jour. Bot.*, 28 (1941), No. 8, pp. 647-656, figs. 7).—"A 0.1-percent solution or emulsion of the ammonium salt of naphthaleneacetic acid injected into the young ovaries of *Melandrium* induces parthenocarpic fruits with well-enlarged placentae and ovules of increased size which develop seed coats and nucellus, but no embryo. Applied to the outside of the ovary or peduncle, the emulsion induces ovary but not ovule development. Naphthaleneacetic acid or indolebutyric acid injected into the ovaries of *Datura stramonium* induces parthenocarpic fruits with greatly enlarged ovules which develop seed coats and often contain a pseudoembryo consisting of several hundred cells. The pseudoembryo originates by proliferation from the inner layer of the integument (endothelium) surrounding the embryo sac. Attempts have so far failed to stimulate division of the egg cell or to increase ovule growth beyond the stage induced by auxin through additional injections of many physiologically active substances. A working hypothesis of the mechanism of the development of fruit, seed, and embryo

is proposed which involves (1) stimulation of development of ovaries, placentae, and ovules, and (2) stimulation of division of polar nucleus and egg cell with or without previous fertilization."

Some chemical differences between artificially produced parthenocarpic fruits and normal seeded fruits of tomato, B. E. JANES (*Amer. Jour. Bot.*, 28 (1941), No. 8, pp. 639-646, figs. 2).—The fruits studied were produced by indolebutyric and indoleacetic acids and by use of pollen of *Lycopersicon peruvianum*, size of fruit varying with production method. The titratable acidity in both parthenocarpic and seeded fruits was the same during all stages of development except for a short time during ripening, when the acid in the seeded fruits was somewhat higher. There were, however, marked differences in the distribution of the acid in different parts of the two kinds of fruit. The percentage of starch in the parthenocarpic fruit was greater at all developmental stages except for ripeness, when both kinds of fruit were very low in starch. Early in development the percentage of sugar was nearly the same in all parts of the fruit. As they matured it increased in the parthenocarpic faster than in the seeded ones, and in the red ripe fruit each region of the parthenocarpic had more sugar than corresponding regions of the seeded fruit. The differences in starch and sugar were reflected in the dry weight and soluble solids. The method used in stimulating parthenocarpic fruit had little or no influence on the chemical variations between them and the seeded fruit. From the fact that the differences observed were almost entirely in the locules, it seems evident that the developing seed profoundly influences the chemical composition of the fruit.

Conditions affecting the acceleration of protoplasmic streaming by auxin, B. M. SWEENEY (*Amer. Jour. Bot.*, 28 (1941), No. 8, pp. 700-702, figs. 3).—The experimental conditions resulting in acceleration as noted by Thimann and the author (E. S. R., 78, p. 760) were compared with those failing to do so, as noted by Olson and Du Buy (E. S. R., 84, p. 162). In oat coleoptile sections infiltrated with water or with 1 percent fructose no acceleration could be noted with any concentration of indole-3-acetic acid, but if not infiltrated or if infiltrated with air the rate of streaming was increased by auxin at 0.01-1 mg./l., as previously reported. Air-infiltrated sections showed more marked acceleration than uninfiltrated sections. Use by Olson and Du Buy of infiltrated sections may have been the principal factor accounting for their failure to observe accelerations of protoplasmic streaming with auxin.

Über die Verhinderung des Etiolements [Prevention of etiolation], E. BÜNNING (*Ber. Deut. Bot. Gesell.*, 59 (1941), No. 1, pp. 2-9).—In young auxin-treated *Sinapis alba* seedlings, the short as well as the long wavelengths of light are able to inhibit etiolation. A photoinactivation by auxin is the decisive factor here, apparently being brought about by absorption of radiation in the carotenoids and especially in the chlorophyll. Later it is only the short wavelengths which are active, apparently through the release of stimulatory processes leading to an arrest of growth in length. This kind of formative action is induced by absorption of radiation in the carotenoids.

Factors affecting root formation of Phaseolus vulgaris, K. V. THIMANN and E. F. POURASSE (*Plant Physiol.*, 16 (1941), No. 3, pp. 585-598, figs. 3).—Studying the rooting of isolated leaves, the survival of such cuttings was greatly improved by the presence of a portion of the stem and varied roughly with the amount attached. The material was extremely sensitive to auxin, over 0.025 mg. indoleacetic acid causing injury, but auxin treatment in nearly all tests considerably increased the number of roots formed. Rooting was slightly depressed by a complete nutrient solution or by the Ca or Mg salts composing it,

was strongly promoted by KNO_3 , and even high dilutions of $(\text{NH}_4)_2\text{SO}_4$ were inhibitory. The growth and maintenance of roots already formed was improved by the complete solution. Of the organic N sources studied, adenine proved most effective, greatly increasing both the percentage of cuttings which rooted and the number of roots formed. Asparagine, guanine, choline, and uracil were also effective to a lesser extent in about that order, and yeast nucleic acid and nicotinic acid showed slight but variable effects. It is concluded that the N nutrition of the isolated leaf is highly important in determining both its survival and its root formation.

Formation of auxin in yeast cultures, T. W. ROBINSON and T. J. B. STIER. (Univ. Ill. et al.). (*Jour. Gen. Physiol.*, 24 (1941), No. 6, pp. 765-769, figs. 2).—Auxin production by bakers' yeast cells was found to resemble the formation observed in other organisms, such as *Rhizopus* and *Rhizobium*, which also form auxins in their culture media. The yield increased with sucrose concentration, and decreased with peptone concentration and with increase in rate of cell multiplication. Below pH 5 the total yield was directly proportional to the H-ion concentration. Thus it was proposed that certain growth conditions favor the breakage of the link between auxin and its protein carrier and consequently accelerate the rate of excretion of auxin into the growth medium.

Production of solutes in growing epidermal cells, W. A. BECK (*Plant Physiol.*, 16 (1941), No. 3, pp. 637-642, fig. 1).—A method was devised and is here described for determining the amount of solute produced in growing cells. When the enlargement of growing epidermal cells and the amount of solute produced therein are determined and correlated for etiolated sunflower seedlings, it is found that the amount of solute produced is proportional to the growth of the cells. It is concluded that the production of solute facilitates the growth process in general and the growth of the wall by intussusception in particular, but that it cannot legitimately be regarded as the prime cause of growth by cell enlargement. There are 14 references.

Selective absorption of cations by higher plants, R. COLLANDER (*Plant Physiol.*, 16 (1941), No. 4, pp. 691-720, figs. 3).—Some 20 phanerogamous plants differing in ecological type were cultured for about 2 mo. in complete nutrient solutions containing several cations in equivalent amounts, when their cation composition was determined by spectral analysis. The cations most closely studied were Na, K, Rb, Mg, Ca, Sr, and Mn. The differences among the plant species cultured in a given solution proved very unequal with regard to the different cations, but the cause of these variations is unknown. The differences observed were for the most part truly specific in character, single species being constantly found relatively rich in certain cations and other species just as constantly so for other cations. With one exception, all halophytes were very rich in Na; three species (buckwheat, corn, and sunflower) were distinguished by their unusually large exclusion of Na; all chenopodiaceous plants (as well as buckwheat) were remarkably rich in Mg; Ca and Sr were absorbed in greatest amounts by sunflower, buckwheat, and white mustard; and oats, corn, and spinach absorbed the last two cations in least amounts. All plants absorbed Rb and Cs almost as rapidly as K, and Sr almost as readily as Ca. On the other hand, all the other cations studied exhibited no mutual correlation in absorption rates. The specific differences among the absorption characteristics of different species were so great that it is impossible to arrange the absorption of cations in any certain order that would be valid for all plants investigated, but the following data are valid for the majority: K, Rb, and Cs are, in general, the cations most copiously accumulated. The next place is in most cases occupied either by Ca and Sr or, about as frequently, by Mg, Li, Na, and Mn. K and Rb ions

and Ca and Sr ions depress the absorption of each other more than do any other cations studied in this respect. It is also notable that Rb or Sr, in the presence of excess K or Ca, respectively, do not obey the general rule that the absorption ratio of a given ion increases when its concentration in the medium decreases. On the contrary, the absorption ratios of Rb and Sr remain constant if only the total concentration of K+Rb, respective to Ca+Sr, is held constant. These findings are explained by assuming that the ions K and Rb, and Ca and Sr, behave in the salt absorption of plants somewhat as identical ions or as two isotopes of the same element. The very complex nature of the selective salt absorption of higher plants is stressed.

The effect on barley seedlings of some interrelations of cations and anions in a three-salt nutrient solution, W. R. MULLISON. (Purdue Univ.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 813-820, figs. 2).—Plants of the nutrient triangle in which the anions were varied were as a whole better than where the cations were varied. Variations in the nutrient solutions had their greatest effect on growth of the plant tops, root growth being much more uniform except in the absence of K, where a marked decrease in their size and weight followed. With nitrates absent, or when a high phosphate-low nitrate relationship existed, a marked P toxicity became apparent. K deficiency symptoms appeared extremely early, before signs of deficiency or toxicity of any other element, and a severe dieback of the seedling leaves resulted. A high Mg concentration in conjunction with an absence of Ca resulted in the death of the terminal meristem and caused some stunting and chlorosis.

Use of nitric acid in control of pH and nitrate levels in nutrient solution, F. M. EATON. (U. S. D. A.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 834-836).—The author calls attention to the advantage of using HNO₃ for maintaining at one and the same time both H-ion concentrations and nitrate levels.

Die bedeutung der Chloridernahrung für die Pflanze, insbesondere für Gemüse [The significance of chloride nutrition for plants, especially vegetables], W. SCHUPHAN (*Forschungsdienst*, 11 (1941), No. 2, pp. 161-176).—A review, with 107 references.

On the occurrence of selenium in plants, H. G. BYERS. (U. S. D. A.). (*Chron. Bot.*, 7 (1942), No. 1, pp. 4-6).

Water uptake and root growth as influenced by inequalities in the concentration of the substrate, F. M. EATON. (U. S. D. A.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 545-564, figs. 5).—When corn and tomato plants were grown with their roots divided between two or more solutions of unequal concentration they developed more roots and took up more water in the dilute solution, and correlative findings indicated that osmotic pressures rather than specific ion effects were primarily involved. Roots divided between distilled water and concentrated nutrient made more growth in the latter, but almost twice as much water was withdrawn from the distilled water during the first 3 days of the test, though this was later reversed. "The investigations were undertaken as a means of appraising the effects of the variability in the concentration of the soil solution often found within the root zone of plants growing on irrigated lands. When soils are permeable and extensively leached this variability may be slight, but under other circumstances it may be great. An example is presented of the situation found in a permeable but lightly irrigated orchard soil wherein 15- to 60-fold variations in the concentrations of sulfate and chloride, respectively, were found within the root zone of single trees." There are 18 references.

Bound water in plant sap and some effects of temperature and nutrition thereon, R. C. CHANDLER. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 4,

pp. 785-798, figs. 4).—Using sap expressed from hardened and unhardened plants of a hardy wheat variety, the cryoscopic method, and two types of reference substances, and interpreting the behavior of the biological solution on the basis of a similar study on artificial colloidal and noncolloidal solutions, it appeared that "bound" water in plant sap is a reflection of all the components of the sap and of the reference substance where such is used. It is a hypothetical amount of water estimated to account for the difference in value of a property of water in complex solution and its value in simple solution. Water in sap seems to have the normal properties of water in any complex solution. Changes in the thermodynamic activity of water in sap as plants harden may be accounted for most satisfactorily by the quantitative and qualitative changes in solutes as a result of physiological response to environment.

Variation and correlation of stomatal frequency and transpiration rate in *Phaseolus vulgaris*, H. B. SMITH (*Amer. Jour. Bot.*, 28 (1941), No. 8, pp. 722-725, fig. 1).—In the bean leaf blades stomatal frequency was highest near the apex and lowest near the midrib, and in different leaves it was apparently higher at the upper than at the lower levels of a plant. Variations were much greater between leaves at different levels than between the parts of a single leaf blade, but the leaves at different levels did not differ in transpiration rate any more than did the parts of a single blade. For comparing plants as to transpiration rate, any comparably exposed and full-grown leaflet of the young plants was used. For comparing them in stomatal frequency, the lower right portion of the plumular leaf was the representative sample used. A positive correlation of 0.431 ± 0.062 between stomatal frequency and transpiration rate was found.

Respiration of leguminous root nodules, G. F. ASPREY and G. BOND (*Nature [London]*, 147 (1941), No. 3735, p. 675).

A highly simplified thermionic control of temperature, R. H. WALLACE and R. J. BUSHNELL (Univ. Conn.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 647-650, figs. 2).—The scheme described and illustrated is a further adaptation of thyatron methods.

Synthetic ability of plants as affected by vernalization, I. N. KONOVALOV and T. M. POPOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., ser.*, 31 (1941), No. 1, pp. 58-60, figs. 3).—From studies of the accumulation of organic matter, formation of protein per unit time in leaves, and the enzyme activity of the plants, it is considered probable that the acceleration of leaf growth and changes in enzyme activity furnish the main basis for the increased productivity following vernalization.

Flowering in *Digitalis purpurea* initiated by low temperature and light, J. M. ARTHUR and E. K. HARVILL (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 111-117, fig. 1).—*D. purpurea* plants given a cold treatment of about 4 mo. (June-October) at 41° F. flowered rapidly when returned to a long day and higher temperature in a greenhouse. The best method found for preserving a slow growth and an excellent appearance of the plants during the long storage treatment was to remove them to a slatted shade in sunlight for 2 days and nights each week. Plants left out-of-doors in cold frames until December 18, then returned to a long day and higher temperature in the greenhouse, flowered after 2½ mo., whereas about 1 mo. of lighting was required after the more carefully regulated cold room treatment at 41°. It is proposed that this flowering response in plants brought about by low temperature be called "thermoperiodism."

The effects of heat and ultraviolet light on certain physiological properties of yeast, T. F. ANDERSON and B. M. DUGGAR (Univ. Wis.). (*Amer. Phil. Soc. Proc.*, 84 (1941), No. 5, pp. 661-688, figs. 6).—Wavelengths shorter than 2,200 a. u. reduced immediately the rate of respiration and caused the cells to

stain with methylene blue. Irradiation with $\lambda 2,650$ caused little reduction in respiratory rate, but prevented the normal increase of respiration in the nutrient. Exposure to 50° C. rapidly reduced the respiratory rate, but brought only a gradually increasing tendency of the cells to stain with methylene blue. All these treatments rapidly reduced the colony-forming ability of the cells. When heat and radiation were combined, the latter sensitized both the colony-forming ability and the staining resistance to subsequent heat treatment. On the other hand, the respiratory rate was independent of the order of heat and radiation treatments. These and further results are consistent with the view that wavelengths shorter than 2,200 a. u. and heat act directly on the respiratory and stain-resisting mechanisms. In preventing the normal increase in respiration, $\lambda 2,650$ inactivates nucleoproteins responsible for producing one or more links in the enzyme chain. That irradiation with $\lambda 2,650$ sensitizes the cells to killing by heat suggests that some nucleoproteins may be injured by irradiation without destroying patterns for forming additional cellular constituents. However, patterns so weakened are readily destroyed by heat. There are 35 references.

An inexpensive integrating light recorder, V. G. SPRAGUE and E. M. WILLIAMS. (U. S. D. A. coop. Pa. State Col.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 629-635, figs. 3).—Though it may not be possible to control the incident light available to experimental plants at various times, interpretations of the results obtained might be facilitated if the total amount of light which the plant had received were known. To overcome the difficulties encountered with recording instruments previously used and to reduce the cost of equipment, an integrating light recorder was constructed from a few electrical parts obtainable from a radio dealer. It is described, and its applications and advantages are discussed.

Treating seed with light: Experiments in Denmark provide some very interesting conclusions on the possible viability of seed, C. JENSEN (*Seed World*, 49 (1941), No. 9, pp. 20-21, fig. 1).—A preliminary report.

Photoperiodism, R. H. ROBERTS. (Univ. Wis.). (*Chron. Bot.*, 6 (1941), No. 19-20, pp. 437-438).—A brief review of recent trends in studies of photoperiodism, and suggestions as to lines for future investigation.

The effect of high concentrations of carbon dioxide on the glutamine and asparagine metabolism of the sugar beet, J. M. FIFE and W. O. FERGUSON. (U. S. D. A.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 677-690, fig. 1).—Asparagine-amide N and NH_3 increased in beet leaf extracts when heated to 80° C., filtered, and allowed to stand, while the glutamine-amide N decreased. No significant change in the N fractions occurred when the aliquots were allowed to stand for 48 hr., provided the H-ion concentration was increased from pH 5.9 to 4.5. A large increase in NH_3 resulted when the beet leaf blades were exposed to 20 and 40 percent CO_2 . This increase in NH_3 could be accounted for by the decrease in asparagine-amide and glutamine-amide N. When exposed to 80 and 100 percent CO_2 there was a significant increase in soluble N, a large increase in NH_3 and asparagine-amide N, and a decrease in glutamine-amide N. When whole leaves were treated with 20 percent CO_2 and the petioles only were analyzed, there was an increase in NH_3 and asparagine-amide N and a decrease in glutamine-N. The asparagine-amide N appeared to be distributed nearly evenly between the petioles and blades, whereas the glutamine-amide N was concentrated in the petioles. The degree of N fertilization of beets apparently has an important bearing on their glutamine and asparagine metabolism while under the influence of high CO_2 concentrations. The leaves of heavily fertilized plants responded to a 20-percent CO_2 treatment by a decrease in glutamine-amide N, whereas leaves of unfertilized plants responded with an increase in glutamine-amide N. Complex soluble substances (probably peptides) were hydrolyzed in the

plant while under the influence of high CO₂ concentrations, yielding asparagine-amide N and under certain conditions glutamine-amide N.

Automatic conductivity measurements of CO₂, D. G. CLARK, J. SHAFER, JR. and O. F. CURTIS. (Cornell Univ.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 643-646, figs. 2).—A conductivity system for measuring photosynthesis, by which readings are automatically recorded as frequently as desired, is described. The apparatus should be easily adjustable to give a wide choice of frequencies of readings ranging from 1-2 min. up to 1 hr. or more and should be adaptable to many different experiments.

Device for measuring the rate of photosynthesis in plants, A. A. NICHFOROVICH and N. G. VASSILIEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 1, pp. 65-68, figs. 2).

Photosynthesis with radioactive carbon, and the distribution of the intermediate products in the plant cell, A. W. FRENKEL. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 654-655).—A note on experiments concerning the distribution of the initial photosynthetic products within *Nitella* cells, radioactive C being used as a tracer.

Photosynthesis in plants at high altitudes, O. V. ZALENSKY (*Comp. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 1, pp. 61-64, fig. 1).—From the data obtained it is assumed that under the prevailing conditions in the eastern Pamirs at heights of about 6,000 m. CO₂ assimilation by the higher plants is impossible even during the warmest season, except for a few days and then only within a very short time. This makes the continued existence of these plants impossible at such altitudes even in a congenial edaphic environment.

Some aspects of the phyllotaxy of tobacco, H. A. ALLARD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 1, pp. 49-55, fig. 1).—Studying a number of commercial American varieties of tobacco, *Nicotiana rustica*, *N. glauca*, and *N. glauca*, several normal leaf arrangements were found expressed by the fractions 1/3, 2/5, 3/8 and 5/13. The 3/8 and 5/13 phyllotaxies are the usual arrangements in tobacco, the 1/3 arrangement being found only in suckers where the main stem is 2/5. Disturbance of normal growth by cutting or topping usually resulted in a lower order of phyllotaxy than that of the main stem. Spiral arrangement may be clockwise or counterclockwise and seems to be a much more stable individual character than the fractional phyllotaxy. It probably never reverses itself except from abnormal torsions.

The variations in form of mycorrhizal short-roots of *Pinus virginiana* Mill. associated with certain soil series, A. P. KELLEY (*Landenberg, Pa.: Landenberg Lab.*, 1941, pp. 10).

Histogenesis in the roots of *Holcus sorghum* L., H.-H. CHI (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 189-205, pls. 4).—A study of the germination and root development of sorghum is presented.

A sieve tube translocation model, R. E. GIRTON. (Purdue Univ.). (*Plant Physiol.*, 16 (1941), No. 4, pp. 831-833, fig. 1).—A simple demonstration model is described and illustrated.

The comparative anatomy of the secondary xylem of five American species of *Celtis*, M. J. COX. (Univ. Ill.). (*Amer. Midland Nat.*, 25 (1941), No. 2, pp. 348-357, figs. 6).

Systematic anatomy of woods of the "Burseraceae," I. E. WEBBER (*Lilloa*, 6 (1941), No. 2, pp. 441-466, pls. 4; *Span. abs.*, p. 441).—The wood anatomy is presented of this group comprising 15-16 genera and about 50 species of tropical woody plants, most of which are large trees, and comparisons are made with 4 other families believed to be of common extraction because of similarities in structure.

Recent work on the types of embryo-sacs in angiosperms—a critical review, P. MAHESHWARI (*Jour. Indian Bot. Soc.*, 20 (1941), No. 5-6, pp. 229-261, figs. 3).—A review with nine pages of references.

The embryogeny and seedling morphology of "Juglans regia" L., C. G. NAST (*Lilloa*, 6 (1941), No. 1, pp. 163-205, pls. 17, figs. 6; *Span. abs.*, p. 163).

Embryoless dill seeds, F. FLEMION and E. WATERBURY (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 157-161, fig. 1).—In 12 lots of dill seeds, most of those failing to germinate proved to be without embryos though the endosperm was present. The occurrence of these embryoless seeds is frequent and accounts for the great variation in the germinative capacity found in the different lots.

Nouvelles observations cytologiques sur le manioc cultivé [New cytologic observations on cultivated manihot], P. BOITEAU (*Chron. Bot.*, 6 (1941), No. 17-18, p. 388).

A technique for the electron microscopic examination of encapsulated bacteria, E. A. KREGEL, J. W. APPLING, B. F. SHEMA, and G. R. SEARS (*Science*, 94 (1941), No. 2451, p. 592).

Studies on the myxobacteria, J. M. BEEBE. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 307-337, pls. 4, figs. 6).—An improved method of isolating myxobacteria from soils and dungs, and *Chondrococcus blasticus* n. sp., are described. The distribution of species of this group in Iowa soils around Ames is shown to be fairly general as regards the families Myxococcaceae and Polyangiaceae. Species of *Myxococcus* were by far the most common, though other genera were represented. Members of the families Sorangiaceae or Archangiaceae were not observed. The biotic relationship of the myxobacteria with the true bacteria is discussed, and it is suggested that it is one of parasitism rather than strict symbiosis or association. Cells of the true bacteria are necessary for the best growth and normal fruiting of some of the myxobacteria, the host cells being destroyed by an extracellular lytic enzyme. Myxobacterial growth rates and fruiting body production increased proportionately with the concentrations of killed bacterial cells up to about 50 mg. per 100 cc. of medium, being less marked above that point. A possible preference for gram-negative, nonsporiferous, nonchromogenic bacteria is noted.

Notes on the CO₂-requirement of bacteria, O. RAHN. (Cornell Univ.). (*Growth*, 5 (1941), No. 1, pp. 113-118).—"Bacteria need carbon dioxide not only during the lag phase for purposes of rejuvenation but also during the period of active growth. Their metabolism at this stage of development is so great that the need of CO₂ can be proved only when very few cells are inoculated. With those bacterial species which produce CO₂ as a metabolic product, the need of CO₂ does not become evident if large numbers of cells are tested. In this case growth and multiplication are greatly retarded but not completely prevented. Species which do not produce CO₂ in their metabolism react more promptly to the removal of CO₂. Even large inocula and young cells cannot overcome the absence of CO₂."

Note on the utilization of carbon dioxide by heterotrophic bacteria, H. D. SLADE, H. G. WOOD, A. O. NIER, A. HEMINGWAY, and C. H. WERKMAN. (Iowa Expt. Sta. coop. Univ. Minn.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 339-341).—*Staphylococcus candidus*, *Aerobacter aerogenes*, *Streptococcus paracitrovorus*, and two species of *Clostridium* were used in this study.

Cellulose decomposition by the saprophytic chytrids, A. J. WHIFFEN. (Univ. N. C.). (*Jour. Elisha Mitchell Sci. Soc.*, 57 (1941), No. 2, pp. 321-330, pl. 1, fig. 1).—By an isolation technic described and with a medium containing

mineral salts, NH_4NO_3 , and cellulose, the cellulose-decomposing ability was demonstrated for seven species of fungi of the Chytridiaceae.

Association between nitrogen-fixing and cellulose-decomposing micro-organisms, H. L. JENSEN and R. J. SWABY (*Nature [London]*, 147 (1941), No. 3718, pp. 147-148).—From experiments briefly reported it appears that N fixation on the basis of cellulose requires either a recurrent exclusion of O_2 or the cooperation of at least one anaerobic component in the microbial association. Therefore, the most favorable conditions for N gains by cooperation between N-fixing and cellulose-decomposing bacteria would seem to exist in heaps of decomposing plant material and in soils frequently subject to waterlogging rather than in well-aerated agricultural soils.

The effect of bacterial contaminations upon the subsequent growth of fungi in the same medium, C. L. PORTER. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 49 (1939), pp. 75-76).—A bacterium closely related to *Bacillus subtilis* was found capable of producing products in potato dextrose agar sharply inhibitory to *Fusarium moniliforme* and *Diplodia zeae* and stable at 250°F . for 30 min. Since media contaminated by certain bacteria were found incapable of supporting normal development of some fungi, it is deemed unsafe to use sterile media previously contaminated by bacteria in any critical studies. Fungus-bacterial combinations are abnormal in probably every instance.

GENETICS

Regional differentiation in plant species, J. CLAUSEN, D. D. KECK, and W. M. HIESEY (*Amer. Nat.*, 75 (1941), No. 758, pp. 231-250, figs. 7).—A discussion of the general relations between plant and climate, a closer study of climatic or regional races of *Potentilla glandulosa* and *Achillea millefolium*, and a summary survey of various other plant species led to the conclusion that the genetic-physiologic differentiation of a plant group is correlated with the climatic zones it occupies. This follows from the fact that the same kinds of environments are occupied by races having similar patterns of reaction, even though belonging to unrelated genera or families. It also appears that it is the genes rather than the chromosome number which determine the climatic adaptation. From the standpoint of enviroal fitness it is evident that the ecologically important unit is not the species but the regional climatic race (ecotype). The evolutionary and ecological ramifications of the survey are discussed in detail. Though there is no evidence that environment directly produces fundamental hereditary species changes, major enviroal alterations do "provide new habitats and refuges for the products of nature's continual experimentation among all the plant species that populate a given area."

Production artificielle de mutations par irradiations, Y. JEAN (*Bonne Terre*, 22 (1941), No. 7-12, pp. 171-186, figs. 4).

Hybrid vigor and weight of germs in the seeds of maize, J. H. KEMPTON and J. W. McLANE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 2, pp. 65-80, fig. 1).—Studies of hybrid and selfed seed, endosperms, and embryos of corn confirmed results reported by Sprague (*E. S. R.*, 77, p. 32). Hybrid vigor in corn is often, although not invariably, reflected in the dry weight of resting embryos. Seed groupings based on texture and color of endosperm but with uniform genic backgrounds disclosed differences in germ weights. The increased weight of embryo relative to increased weight of endosperm offered equivocal evidence on the hypothesis that hybrid vigor results from the interaction of dominant factors favorable for growth.

Intergeneric hybridization of cereals and other grasses, D. C. SMITH. (U. S. D. A. coop. Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 1, pp. 33-47, pls. 2).—Attempts were made to hybridize wheat (*Triticum aestivum*) with grasses, including 15 species of *Agropyron*, 7 of *Elymus*, 2 of *Festuca*, *Lolium perenne*, and *Secale montanum* as pollen parents. Hybrid plants were obtained only in *T. aestivum* × *A. elongatum*, *T. aestivum* × *A. intermedium*, and *T. aestivum* × *A. trichophorum*. When varieties of rye (*S. cereale*) were studied in combinations with 9 species of *Agropyron*, 7 of *Elymus*, and *Bromus inermis*, *Hordeum bulbosum*, and *S. montanum*, the following were successful: *S. cereale* × *A. repens*, *S. cereale* × *A. sibiricum*, *S. cereale* × *A. trichophorum*, and *S. cereale* × *S. montanum*. Five species of *Agropyron*, 2 of *Bromus*, 9 of *Elymus*, and 4 of *Hordeum*, and *F. idahoensis* and *S. montanum* were used as male parents in crosses with *H. vulgare*, but no hybrids were obtained. Limited efforts to hybridize cultivated oats (*Avena sativa* and *A. byzantina*) with other grasses, particularly *Arrhenatherum elatius*, were unsuccessful. Hybrid plants studied were sterile in all crosses except those derived from *S. cereale* × *S. montanum*. Within wheat or rye, female parental varieties were not equal in compatibility as shown by hybrid seed development.

Hybridization, cytology, and polyploidy of Gossypium, J. O. BEASLEY. (Tex. Expt. Sta.). (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 394-395).

Inheritance of smooth and pitted bolls in Pima cotton, E. G. SMITH. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 2, pp. 101-103, fig. 1).—Pitted (B^p) and smooth (B^s) bolls in Pima cotton (*Gossypium barbadense*) behaved as allelic characters. The inheritance, as indicated by segregation in F_2 and backcross populations, was monohybrid without indication of dominance. Success in analyzing the inheritance of smooth and pitted boll surface might be attributed to similar genetic backgrounds in the two strains used, i. e. P Hope and ordinary Pima.

Inheritance of cluster habit and its linkage relation with anthocyanin pigmentation in upland cotton, J. W. NEELY. (U. S. D. A. coop. Miss. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 2, pp. 105-117, fig. 1).—In crosses between cotton strains characterized respectively by red plant, noncluster habit ($R_1^{RO} R_2^{RO} Cl Cl$) and green plant, cluster habit ($r_1^{ro} r_2^{ro} cl cl$), the F_1 differed slightly from the noncluster parent, but the noncluster characteristic was dominant, or practically so. In F_2 and backcross generations the ratios of noncluster to cluster obtained verified the previous conclusion that the characteristic is controlled by one genetic-factor pair. The R_1^{RO} and Cl genes were found to belong to the same linkage group, and the percentage of recombinations was not far from 18.5.

Experimentally produced haploids in Nicotiana tabacum by means of X-rays, N. P. BADENHUIZEN (*Natuurw. Tijdschr. Nederland. Indië*, 101 (1941), No. 8, pp. 240-242, figs. 4).

A colchicine-induced tetraploid cabbage, E. H. NEWCOMER. (Univ. N. C.). (*Amer. Nat.*, 75 (1941), No. 761, p. 620).—A brief account is presented upon the origination of a tetraploid self-fertile cabbage by the treatment of Ferry Hollander seedlings with a 0.2-percent solution of colchicine. The flowers and the pollen grains of the tetraploid were larger than those of normal diploid plants. One of the treated plants was a mixoploid with chromosome numbers of $2n$ and $4n$ in the same inflorescence.

Cytological studies in Lactuca, T. W. WHITAKER and R. C. THOMPSON. (U. S. D. A.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 6, pp. 383-394, figs. 9).—Observations on the principal details of meiosis in nine F_1 hybrids produced from a series of interspecific crosses in *Lactuca* are presented. Three of the crosses

were between species with 9 pairs, four between species with 9 and 17 pairs, and two between species with 17 pairs of chromosomes. An analysis of pairing behavior and irregularities indicated that the 9-chromosome species consist of at least two distinct compatibility groups. The 17-chromosome group was found very homogeneous and probably was descended from a single amphidiploid or may have resulted from a single occurrence of amphidiploidy. A closely related paper was recently noted (E. S. R., 86, p. 176).

Inheritance of a leaf variegation in beans, W. J. ZAUMEYER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 2, pp. 119-127, fig. 1).—A type of variegation that appears both on the primary and trifoliate leaves of certain varieties of beans is described and discussed as to inheritance when affected varieties are crossed with varieties of normal green color. That the variegation is not a virus manifestation was indicated by a failure to infect susceptible varieties by the usual methods. The occurrence of a high percentage of lethals among the variegated plants in the progeny of crosses between susceptible and normal varieties is believed to indicate that such were true-breeding recessives. The survivors were probably carrying some of the inhibiting factors, possibly in the heterozygous condition. This type of heritable variegation has been found of importance in Wisconsin Refugee and, to a lesser extent, in Idaho Refugee, both of which had Corbett Refugee as one parent. For the most part the data on heritability supported the two-factor Mendelian hypothesis. The F_1 plants of reciprocal crosses were normal green, and a ratio of 15 green plants to 1 variegated was observed in the F_2 generation. The fact that the variegated recessive progenies, except in a few cases, did not breed true in the F_3 generation is thought due to the presence of one or more inhibiting factors that suppressed the variegation factor.

Inheritance of factors influencing sucrose percentage in Beta vulgaris, J. O. CULBERTSON. (U. S. D. A. coop. Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 3, pp. 153-172).—The inheritance of sucrose factors was studied in crosses between inbred lines of beets differing in percentage of sucrose. The average sucrose percentage of F_1 and F_2 approximated the mean of the parents. F_2 progenies and progenies of selfed backcrosses were obtained that did not vary more than the parental inbreds and were as high in mean sucrose percentage as the high-sucrose parent. It appeared that relatively homozygous lines of desirable sucrose percentage could be obtained with comparative ease. Ability to store sucrose was inherited in a quantitative manner and depended upon the interaction of several factors. The correlation between the sucrose percentage of mother beets selected from segregating populations and the means of their inbred progenies was highly significant.

Simple and complex periclinal tetraploidy in peaches induced by colchicine, H. DERMEN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 141).—Tetraploid tissues were observed in peach seedlings following treatment of the newly germinated seed with colchicine. Enlarged pollen grains suggested that the tissues from which they developed were polyploid. An examination of sections of tips of growing stems showed in one case that the epidermis was tetraploid and the inner tissues diploid. In another plant, on one side the epidermis and all the cortex, except a small area next to the stele and pith, were tetraploid. On the other side, the epidermis was diploid and all the inner tissues were tetraploid.

Inheritance of earliness of flowering in the sweet pea, T. M. LITTLE and J. H. KANTOR (*Jour. Hered.*, 32 (1941), No. 11, pp. 379-383, fig. 1).—Based on the results of numerous crosses carried forward through several progeny generations, it is concluded that the early-flowering character in the sweet pea, *Lathyrus*

odoratus, is recessive to late flowering, and the difference is due to a single pair of alleles.

Megagametophyte development in a triploid tulip, J. M. BELLOWES, JR., and R. BAMFORD. (Md. Expt. Sta.). (*Bot. Gaz.*, 102 (1941), No. 4, pp. 699-711, figs. 43).—Studies of the Inglescombe Yellow tulip, a variety with 36 chromosomes in the somatic cells of the early nucellar layer and in the surrounding cells of the ovule and ovary, showed that the megagametophyte is of the *Fritillaria* type and that four divisions are necessary to form the mature gametophyte. Trivalents, bivalents, and univalents were observed during the meiotic prophase of the first division. The occurrence of lagging chromosomes and micronuclei was infrequent. There was an unequal separation of the chromosomes in both the meiotic and subsequent divisions.

Abstracts of papers presented at the 1941 meetings of the Genetics Society of America: Cold Spring Harbor, New York, August 27-29, 1941; Dallas, Texas, December 29-31, 1941 (*Genetics*, 27 (1942), No. 1, pp. 129-176; also in *Genet. Soc. Amer. Rec.*, 10 (1941), pp. 129-176).—Abstracts of the following papers of interest to animal geneticists (E. S. R., 85, p. 746) are included: Two Modifiers of Self (*S*) and White-Spotting (*s*) in Guinea Pigs, by M. R. Baker and H. L. Ibsen (p. 130) (Kans. State Col.); The Physiology and Inheritance of the Hemophilia-like Abnormality in Swine, by R. Bogart, M. E. Muhrer, and A. G. Hogan (p. 133) (Mo. Expt. Sta. coop. U. S. D. A.); Inheritance of Shape of Vaginal Orifice in the Mouse, by E. B. and H. B. Chase (p. 136) (Univ. Ill.); A Mutation Toward Normal Eyes in the Anophthalmic Strain of Mice, by H. B. Chase (p. 136) (Univ. Ill.); The Production of Somatic Mutations in the Pigeon With X-rays, by L. J. Cole and H. E. Finley (p. 138) (Univ. Wis.); Translocations in *Sciara*: Their Effect on Chromosome Behavior and Sex Determination, by H. V. Crouse (pp. 138-139) (Univ. Mo.); Genic Effects on Serum Proteins, by R. W. Cumley, M. R. Irwin, and L. J. Cole (p. 139) (Univ. Wis.); Genetic Problems of the Grouse Locust *Tettigidea parvipennis* Harris, by C. M. Good, Jr., and R. K. Nabours (p. 143) (Kans. Sta.); Dominant and Recessive Responses of the *Sd* Factor in Natural and Domesticated Fish Populations (p. 144), and A Third Primary Factor, *Sd*, for Melanomas in Hybrid Fishes (pp. 144-145), both by M. Gordon; On the Physiological Basis of Inherited Disease Resistance, by J. W. Gowen (p. 145) (Iowa State Col.); A Sexually Dimorphic Factor in the Pigeon, by W. F. Hollander (p. 146); Gene Interaction in *Peromyscus*, by R. R. Huestis (pp. 146-147); Heredity in Rat Caries, by H. R. Hunt, C. A. Hoppert, and W. G. Erwin (p. 147) (Mich. State Col.); On the Linkage Relations and Manifestation of Polydactyly in the Fowl, by F. B. Hutt and C. D. Mueller (pp. 147-148) (Cornell Univ.); Suggestive Evidence for Duplicate Action of Genes, by M. R. Irwin and R. W. Cumley (p. 148) (Univ. Wis.); Modifiers of the Sex-Linked Gene for Barred Feathers and Sex Identification in Newly Hatched Chickens, by R. G. Jaap (p. 149) (Okla. Sta.); A Cytological Study of the Embryonic Livers (16-18 Days) of Normal and Flexed-Tailed (Anemic) Mice, by R. J. Kamenoff (p. 150); The Taming Effect of Coat Color Genes in the Norway Rat, by C. E. Keeler and H. D. King (p. 151); Screw-Tail, a New Mouse Mutation, by T. Laanes and E. C. MacDowell (pp. 151-152); Genetic Selection for Low Fecundity in the Fowl, by W. F. Lamoreux, F. B. Hutt, and G. O. Hall (p. 152) (Cornell Univ.); A New Mutation of Fowl Affecting the Axial Skeleton, Especially in the Tail Region, by W. Landauer (pp. 152-153) ([Conn.] Storrs Sta.); A Genetic Study of the Pattern of the Vena Cava Inferior in the Rabbit, by C. W. McNutt and P. B. Sawin (p. 156); Preparation of a Nucleohistone From Mammalian Organs, and Direct Demonstration of Its Nuclear Origin, by A. W.

Pollister and A. E. Mirsky (pp. 160-161); Inheritance of an Eye Anomaly in the Albino Rat, by J. H. Quisenberry [Quisenberry] and S. O. Brown (pp. 162-163) (Tex. A. and M. Col.); Genetic Hermaphroditism in a Strain of Pigeons, by O. Riddle, H. H. Dunham, and J. P. Schooley (p. 165); Increased Viability of Homozygous Yellow Mouse Embryos in New Uterine Environments, by G. G. Robertson (pp. 166-167); Suppression of a Dominant Character, Polydactylism, in the Domestic Fowl, by P. D. Sturkie (p. 172) (Ala. Sta.); and A Case of Inherited Partial Sterility and Embryonic Mortality in the Rat, by E. Waletzky and R. Owen (p. 173) (Univ. N. C. and Wis.).

Some factors affecting fertility in swine, R. W. PHILLIPS and J. H. ZELLER. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 439-442).—Among 1,354 sow-breeding seasons in several breeds, more than one-fifth failed to conceive. The difference, at least in part, was related to breed. Conception failed to occur in 13.9 percent of the Duroc-Jerseys and 36.9 percent of the Tamworths. Among all the sows bred it was calculated that only 27.1 percent of the ova developed into weanling pigs. The level of fertility in boars of different breeds was variable, as indicated by services per pregnancy, size of litter, percentage of offspring weaned, and proportion of abnormal pigs.

Tests for linkage in the guinea pig, S. WRIGHT (*Genetics*, 26 (1941), No. 6, pp. 650-669).—Continuing the study of linkage relations in the guinea pig (E. S. R., 60, p. 630), there was only one case of probable linkage between genes R and Px found in 21,867 recombination crosses exhibiting 10 characters from suitable backcrosses. "Genes R and Px gave recombination percentages of 41.10 ± 4.14 percent in coupling data in females, 39.29 ± 9.45 percent in repulsion data in ♀s, 42.75 ± 3.01 percent in coupling data in ♂s, 42.50 ± 5.59 percent in repulsion data in ♂s, and in the grand total 42.08 ± 2.17 percent recombination or 3.65 times the standard error on the hypothesis of independence." It appeared that one of the three or four major factors responsible for normal polydactyly was probably linked with the agouti gene. No cases of partial or total sex linkage were found.

Linkage studies of the rat (*Rattus norvegicus*), V. W. E. CASTLE and H. D. KING. (Univ. Calif. et al.). (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 8, pp. 394-398).—Loci in the albino chromosome (E. S. R., 85, p. 747) were established from the characteristics of 523 progeny of gray nonwaltzers of the constitution $\frac{CpW}{cPw}$ mated to homozygous triple recessives and from studies by Grüneberg (E. S. R., 83, p. 181) as 0, 3.3, 3.8, 23.3, and 58.6 for the genes lethal (l), albino (c), red-eyed yellow (r), pink-eyed yellow (p), and waltzing (w), respectively. The loci of the genes in chromosome II were ascertained as curly (Cu), 0; anemia—a lethal (an), 2; and brown (b), 45. These loci were established from characteristics of the 1,370 progeny of triple heterozygotes of the genetic formula $\frac{Cu\ an\ b}{++B}$ mated with animals homozygous for brown but heterozygous for anemia because of its lethal effect.

A case of spontaneous intersexuality in the rat, M. W. BURRILL, R. R. GREENE, and A. C. IVY (*Anat. Rec.*, 81 (1941), No. 1, pp. 99-117, pls. 2, fig. 1).—The anatomy of a spontaneously occurring intersexual rat is described. The animal possessed an ovary on the left side and a subperineal ovotestis on the right side. The secondary sex organs of both sexes were present.

Autosomal and sex chromosomal translocations and viability in *Apotettix eurycephalus* Hancock, R. K. NABOURS, F. M. STEBBINS, and W. R. B. ROBERTSON. (Kans. Expt. Sta. et al.). (*Jour. Expt. Zool.*, 88 (1941), No. 2, pp. 239-261, pl. 1, fig. 1).—Translocations of unequal portions of two autosomes and of chro-

matin and centromere from one autosome to the X chromosome in this species were induced by X-ray treatment. In the latter case an autosomal dominant color pattern was changed to a sex-linked character. Excesses of chromatin were deleterious to the viability of both sexes, but ♂s were less drastically affected than ♀s. The cytological observations were correlated with the genetical results.

Genetic studies on *Chorthippus longicornis*, M. CREIGHTON and W. R. B. ROBERTSON (*Jour. Hered.*, 32 (1941), No. 10, pp. 338-341, fig. 1).—Four characteristic color patterns of *C. longicornis* were found due to a multiple allelic series designated as s^+ , s^V , s^L , s^R . Pattern of the British form of the same species are described.

Polydactyl feet of two strains of chicks, M. T. HARMAN and F. NELSON. (Kans. State Col.). (*Amer. Nat.*, 75 (1941), No. 761, pp. 540-549, figs. 10).—Anatomical differences and similarities between the two types of polydactyly in fowls noted by Warren (*E. S. R.*, 85, p. 36) are presented.

The "early lethal" action of the homozygous creeper factor in the chick, J. M. CAIRNS (*Jour. Expt. Zool.*, 88 (1941), No. 3, pp. 481-503, pls. 2, fig. 1).—Study of embryos from the creeper stock of Landauer (*E. S. R.*, 83, p. 475) showed the early lethal effect of the creeper factor to be localized in the circulatory system. Blocking of the vitelline artery of normals produced the same anastomosis of dorsal aorta-cardinal vein. The blood pressure increased in these vessels and caused a swollen condition. Intermediate stages cause phocomelic embryos which survived the fourth day of incubation. There still remains the uncertainty as to whether the circulatory disturbance precedes or follows the growth disturbance.

Reciprocal crosses between the guinea and the domestic fowl, R. D. OWEN. (Wis. Expt. Sta.). (*Jour. Expt. Zool.*, 88 (1941), No. 2, pp. 187-217, pls. 2).—There were produced 16 fertile eggs by mating roosters with guinea hens and 36 fertile eggs by mating guinea cocks with hens by the artificial insemination methods of Burrows and Quinn (*E. S. R.*, 81, p. 773). Mortality of these embryos was very heavy. None of the guinea ♂ × chicken ♀ embryos hatched, and of the 11 embryos from chicken ♂ × guinea ♀ permitted to go through incubation only 1 hatched. In the former cross, about half of the embryos died in the primitive streak stage and about half died after the circulatory system had developed in a normal fashion. Embryonic death was not so complete a barrier in the cock × guinea hen cross since dead embryos were found on the fourth day and from the fifteenth day of incubation to pipping of the egg. Evidently the two species are naturally kept separate by morphological and psychological barriers in addition to the low viability of the hybrids. Inadequate knowledge of the sex ratio of the guinea ♂ × hen hybrids because of the early mortality did not allow an analysis of differences in the mortality of the sexes. The ratio of seven ♂s to three ♀s in the reciprocal cross is considered to approximate equality. There were found to be abnormalities of the head region of the guinea ♂ × chicken ♀ hybrids and structural abnormalities of the adult testis of the reciprocal cross which indicate a developmental imbalance.

Bioassay of the growth hormone of the anterior pituitary, W. MARX, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 1, pp. 1-10, figs. 4).—Standard methods with hypophysectomized immature and normal ♀s 5 to 6 mo. of age served for study of the effects on body weight of different doses injected daily for 10- to 20-day periods. The relation between the logarithm of the daily dose and the body weight gain was expressed by a straight line, the slope characteristic of growth hormone preparations. Either type of test animal could be used, but each had limitations.

The gonad-stimulating potency of the pituitary of hypothyroid young male rats, K. F. STEIN and M. LISLE (*Endocrinology*, 30 (1942), No. 1, pp. 16-24).—The gonad-stimulating potency of the pituitaries of young ♂ rats were reduced at from 21 to 50 days after thyroidectomy. Histological study showed a decrease in the number and size of the eosinophiles with a corresponding increase in the number of chromophobes and basophiles. Observations were made on young thyroidectomized ♂s and the effects of their pituitary glands on ♀ litter mates. There were increases in weights of the ovaries and uterine tubes as compared with uninjected controls.

Clinical observations on the use of equine gonadotropin in the mare and cow, H. S. CAMERON. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 60-62).—Of 9 mares and 46 cows which were treated with equine gonadotropin in an attempt to induce oestrus where the cycle was dormant, all of the mares responded within 10 days, whereas 25 cows failed to respond.

Semen studies in the bull, R. W. DOUGHERTY and H. P. EWALT. (Oreg. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941) No. 5, pp. 419-426, figs. 7).—The chemical and physical characteristics are given of 645 semen samples from 103 bulls, together with reports of success in the artificial fertilization of cows. Refrigeration and chemical inactivation in the first few hours prevented the pH changes associated with lowered motility and viability. The ascorbic acid content of the semen samples varied from 0.22 to 8.15 mg. per 100 cc., but the relation to motility and viability, although suggested, was irregular.

Phospholipids as a source of energy for motility of bull spermatozoa, H. A. LARDY and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 134 (1941), No. 3, pp. 542-548, figs. 3).—Oxygen consumption of bull spermatozoa, as determined by methods employed in previous studies (E. S. R., 86, p. 316), was not appreciably increased by lecithin additions to a medium containing glucose. This is in agreement with previous conclusions (E. S. R., 85, p. 749) that the intracellular reserves of the spermatozoa are phospholipoid in nature.

The rate at which spermatogenesis occurs in the rabbit, S. A. ASDELL and G. W. SALISBURY. (Cornell Univ.). (*Anat. Rec.*, 80 (1941), No. 2, pp. 145-153, pl. 1).—When the testes were transferred from the scrotum of the rabbit, a short interval in the abdomen produced damage requiring a much longer time to repair. The rate of recovery after return to the scrotum was roughly proportional to its stay in the abdomen, although there was an unaccountable lag in the recovery of those that had been in the abdominal cavity for a long period. Those that were in the abdominal cavity for 4 or 5 days did not produce spermatozoa, even after 49 days, on being replaced in the scrotum. These results on sperm production in the rabbit are contrasted with that in the bull, ram, and boar.

The viability of spermatozoa in the abdominal epididymis and the failure of motile sperms to fertilize ova, S. A. ASDELL and G. W. SALISBURY. (Cornell Univ.). (*Amer. Jour. Physiol.*, 132 (1941), No. 3, pp. 791-795).—Anchoring the testes of mature rabbits to the ventral abdominal wall caused spermatogenesis to cease in 24 hr. Destruction of the fertility occurred in 8 days, and among 29 matings by ♂s with testes in the abdominal cavity for 9 or 10 days no matings were fertile. Although some motility was observed in one case up to 14 days, all of the 12 showed immotile sperm after 15 days in the abdomen. Motile but nonfertile sperm failed to survive to ovulation in ♀s after mating.

Development of the testes and combs of White Leghorn and New Hampshire cockerels, J. E. PARKER, F. F. MCKENZIE, and H. L. KEMPSTER. (Mo. Expt. Sta. coop. U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 1, pp. 35-44, figs. 3).—

The testicular weight of White Leghorn and New Hampshire cockerels increased at the same rate to 12 weeks of age, but at from 12 to 24 weeks the testes of the New Hampshires doubled their weight while White Leghorn testes increased sevenfold. However, from 24 to 30 weeks the testes of the New Hampshires increased almost five times in weight. Although the comb weights were about the same in the two breeds at hatching, at 4 weeks of age the Leghorn combs were more than twice as large and at 24 weeks were more than three times the size of the New Hampshire combs. At from 12 to 24 weeks the combs of the New Hampshires were about proportional to the body growth, but in the Leghorns the comb weights increased nearly twice as rapidly as body weights. From a histological standpoint there was remarkable similarity in the development of the two breeds. Mature spermatozoa were in the testes of two 12-week-old Leghorn and three New Hampshire cockerels. The diameter of the seminiferous tubules increased after 8 weeks, but final growth was somewhat later in the heavier breed. As to fertility, one 16-week-old White Leghorn cockerel fertilized one of the two ♀s with which he was mated. At 24 weeks of age, White Leghorn cockerels were generally successful in fertilization, but none of the New Hampshire cockerels were capable of fertilization until 24 weeks of age. The study was based on the comb, testis, and body weights in histological examination of the testes of 24 White Leghorn and 26 New Hampshire cockerels up to 475 days of age.

Gonadotropic hormone in AP of male and female rabbits during growth, A. J. BERGMAN and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 1, pp. 11-15, figs. 4).—Because of the sensitivity of chicks in gonad weight increase studies to light and temperature variations, special care had to be exercised in the use of the chick for determinations of age changes in amount of gonadotropic hormone in the pituitaries of rabbits (E. S. R., 86, p. 670). In the ♂ rabbit the amount of the hormone per 100 gm. of body weight or per gland increased very rapidly until a body weight of about 2,500 gm. was attained. Testis weight increased over this period but continued to increase for a longer period. In ♀ rabbits the gonadotropic hormone in the pituitary increased rapidly at weights of from 500 to 1,500 gm. Ovarian weights increased slowly in animals weighing up to 3,000 gm. The gonadotropic hormone content of the ♂ anterior pituitary was about 70 percent greater than that of the ♀.

Effect of sex hormones, separately and combined, on the proliferation and hydration of combs and cloacae of male chicks, I. L. KOSIN and S. S. MUNRO (*Endocrinology*, 30 (1942), No. 1, pp. 102-106, figs. 2).—A "puffing" reaction was induced in the cloacal region of baby chicks by daily injection of testosterone propionate or oestradiol dipropionate. Comb growth was markedly stimulated by the androgen, but was little affected by the oestrogen. There was no synergistic or antagonistic effect of the two hormones administered together.

Effects of estrogen on androgenic stimulation of the prostate and seminal vesicle of the rat, R. R. GREENE and D. M. THOMSON (*Endocrinology*, 30 (1942), No. 1, pp. 85-89).—Daily treatments for 21 days with 50 γ of testosterone propionate restored the prostate weight of castrate ♂s to about 200 gm., which nearly equaled that of uncastrated animals. Oestrogen alone caused some increase in the size of the prostates and a marked increase in seminal vesicles, but when administered with the testosterone its effectiveness was reduced.

Pubertal increase in responsiveness to androgen in the male rat, C. W. HOOKER (*Endocrinology*, 30 (1942), No. 1, pp. 77-84, figs. 6).—Rats castrated at birth exhibited their greatest responsiveness of the prostates to testosterone at the age of from 40 to 60 days. Larger doses of testosterone were required at

younger ages to show recognizable response in the accessory organs. Groups of rats castrated at birth were treated with different amounts of the testosterone at ages ranging from 10 to 120 days, and the weights and character of the prostates were determined at autopsy 6 days after injection.

Difference in response of mice of different strains to human pregnancy urine. K. P. HUMMEL (*Endocrinology*, 30 (1942), No. 1, pp. 74-76).—Tests of response of immature and adult ♀s of different strains to the Ascheim-Zondek test showed marked differences in the number of follicles produced. Differences in the response of immature and adult ♀s to an extract of the pregnancy urine suggested variations in the endocrine balances found in the strains.

Factors underlying the failure of cyclic mating behavior in the albino rat. J. L. BOLING, R. J. BLANDAUF, B. RUNDLETT, and W. C. YOUNG (*Anat. Rec.*, 80 (1941), No. 2, pp. 155-171, pl. 1).—Study of 21 rats in which the occurrence of oestrus was irregular or absent led to the conclusion that the basic factor was a low threshold of sensitivity to oestrogen. The ovaries of about half of these animals were normal histologically, but they did not necessarily remain so, as indicated by the second ovary removed at a later date than the first. The different responses of the spayed ♀s to variable doses of oestrogen and progesterone served as the measure of oestrogen sensitivity. Deficiency of hypophyseal stimulation is considered responsible for the cases of abnormal follicle development and luteinization.

The effects of lactation on the implantation of ova of a concurrent pregnancy in the rat. R. H. KREHBIEL. (Univ. Ill.). (*Anat. Rec.*, 81 (1941), No. 1, pp. 43-65, pl. 1).—No marked differences were found in the weights up to 20 days and the mortality of young rats suckled by nonpregnant animals or mothers in the second to the ninth pregnancy. The implantation time determined by successive laparotomies was 16 ± 1 days prior to parturition. Delays in implantation dates occurred between 6 and 20 days after mating, but the extent of these delays did not appear to be dependent upon the number of young born or suckled during the first 4 to 5 days. A suckled litter of six or more may induce a delay in implantation, but each animal and pregnancy exhibited its reaction to each degree of mammary gland activity. Successive pregnancies tended to reduce the effects of lactation. The relative size of the dam and litter may determine the length of the latent period. Unilateral ovariectomy in mated dams prevented attachment of the ova when performed prior to implantation but had no effect on pregnancies that had progressed further.

The production of deciduomata in the pregnant lactating rat. R. H. KREHBIEL. (Univ. Ill.). (*Anat. Rec.*, 81 (1941), No. 1, pp. 67-77, figs. 4).—Further studies³ on the responses of the endometrium of unilaterally ovariectomized pregnant rats to electrical or needle stab stimuli showed fundamental differences in the decidual and decidual reactions produced.

Influence of adrenal and sex hormones on the differentiation of melanophores in the chick. H. L. HAMILTON (*Jour. Expt. Zool.*, 88 (1941), No. 2, pp. 275-305, pls. 2, figs. 2).—Studies of the effect of hormones on melanophore development in tissue cultures of skin ectoderm from New Hampshire Reds, Rhode Island Reds, and Barred Plymouth Rocks showed that testosterone, oestrone, and sesame oil increased the number of black melanophores from red breeds, whereas oestradiol and olive oil decreased them. Oestradiol, testosterone, and desoxycorticosterone inhibited the differentiation of black melanophores in explants from Barred Plymouth Rock embryos. Evidently the hormones may act as inhibitors or catalysts on the rate of melanin synthesis within the cell.

³ *Anat. Rec.*, 73 (1939), No. 3, Sup. 2, pp. 32-33.

Pregnancy diagnosis in swine by a chemical test, S. Y. ROTH, D. T. MAYER, and R. BOGART. (Mo. Expt. Sta. and U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 5, pp. 436-438, figs. 2).—A modified Cuboni test⁴ is recommended for ascertaining pregnancy in the sow only between the twenty-first and thirty-second days of gestation. Therefore, breeding records must be available.

Does a stimulation of the germinative epithelium of immature male rats occur after treatment with gonadotropic hormones, augmentative substance, androgens, and vitamin E? B. ZONDEK, A. BRZEZINSKI, and F. SULMAN (*Endocrinology*, 30 (1942), No. 1, pp. 25-31).—Spermatogenesis was not produced in 20-day-old ♂ rats treated for 10 days with pregnancy urine prolan or gonadotropins from pregnant mare blood, anterior pituitary, menopause urine, and ♂ urine when fed a vitamin E-rich ration. Augmentation with cock serum also gave no acceleration of spermatogenesis. Some acceleration in spermatogenesis was induced by testosterone in combination with anterior pituitary gonadotropin and cock serum or ♂ urine gonadotropin and cock serum, but there was no sperm formation. The two combinations led to formation of sperm heads in 30-day-old rats. Evidently spermatogenesis in mammals is a more complex process than ovogenesis.

FIELD CROPS

[Field crops research in the Bureau of Plant Industry]. (Partly coop. State expt. stas. et al.). (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1941, pp. 2-5, 6-9, 10-11, 13-15, 15-16, 20, 21-22, 22-23, 23-24, 32, 33-34, 35-36).—Significant accomplishments and progress results are reported from breeding work with corn, wheat, oats, barley, seed and fiber flax, cotton, red and white clover, lespedeza, soybeans, peanuts, Kentucky bluegrass, orchard grass, bentgrass, potatoes, sugarcane, and sugar beets. Examples of the improvement work include U. S. Hybrid 13 corn, outstanding in productivity; hardy winter barleys and oats and spring oats, also disease-resistant; disease-resistant seed flax of improved seed and oil quality developed; dual-purpose grain and forage sorghums; a strain of alfalfa resistant to bacterial wilt; edible varieties of soybeans ranging from 75 to 165 days from planting to maturity, differing markedly in flavor and cooking quality, and either immune or highly resistant to attack of Mexican bean beetle; improved turf grasses, including bentgrasses, bluegrass, and fescue selections; potatoes resistant to leafhopper injury and a method of producing virus-free seed potatoes; U. S. 22 sugar beet variety improved in curly top resistance replacing older sugar beet varieties, and the leaf spot-resistant sugar beet variety U. S. 200×215 sugar beet for eastern districts; and sugarcane varieties potentially improved in disease resistance, cold tolerance, and other respects, and new sugarcane promising because of yield and other characteristics as apparent resistance to deterioration and loss of sugar when windrowed. Cultural experiments have demonstrated the superiority of September seedings of winter wheat in the Great Plains over earlier seeding as to foot rot damage; improvement of rice yields by rotation with pasture grasses and legumes; reduction in yield of rice due to turning under of rice straw more than overcome by addition of ammonium sulfate to the straw; importance of sucker stalks in grain sorghum production, as shown in variety-spacing tests; establishment of crested wheatgrass by seeding in the fall directly into weeds or stubble indicating an economical way to reclaim abandoned farm lands; Russian wild-rye (*Elymus junceus*) as potentially valuable for dry-farming areas of the

⁴ Klin. Wehnschr., 13 (1934), No. 8, pp. 302-303.

northern Great Plains to supplement or to be used in a mixture with crested wheatgrass; merits of early planting of sugar beets in northern Great Plains; and manure and superphosphate in aiding establishment of kudzu. Other research dealt with crop production under irrigation; quality of irrigation and drainage waters; livestock and forage production contributing to stability of agriculture in the Great Plains; fertilizer and spacing studies on potatoes; cotton investigations, including use of X-ray in study and breeding of cotton, isolation of a strain of green lint cotton that has a wax content of from 15 to 17 percent (about 30 times as much wax as the ordinary white or cream-colored lint cottons of commerce), superior strains of cotton produced by in-breeding, cotton improvement in one-variety communities, influence of field and storage conditions on cottonseed vitality and composition, and promotion of sea-island cotton production in Florida and Georgia; production of abacá (Manila hemp) in the American Tropics; fiber flax studies; a detailed study of flue curing of tobacco from a biochemical viewpoint, temperature and humidity requirements, and modifications in conditions for different types and grades of leaf; control of bindweed by improved tillage methods; and sagebrush and shrub control in range improvement.

[Field crops research by the Georgia Station]. (Partly coop. U. S. D. A., Ga. Coastal Plain and Fla. Expt. Stas., et al.). (*Georgia Sta. Rpt. 1941*, pp. 15-24, 28, 52-55, 59-68, 78-89, 99-100, 102-105, 129, 130, 131, 135-137, 138-140, 144-148, figs. 10).—Investigations reported with field crops (E. S. R., 84, p. 33) at the station and Mountain Substation and outlying fields included breeding work with wheat, oats, cotton, peanuts, and potatoes; genetic studies with cotton; variety tests with corn, cotton, oats, wheat, soybeans, peanuts, cowpeas, sorgho for sirup, potatoes, sweetpotatoes, and winter legumes; comparative yields of corn and small grains; fertilizer experiments with cotton, corn, oats, sorgho, peanuts, soybeans, and pastures; a cotton variety-wilt-phosphorus study; cotton after cowpeas plowed under at different dates, after vetch, after sericea lespedeza, and after a general rotation, variously supplemented with fertilizers; delinting cottonseed on small experimental cotton gins; treatments for peanut seed; planting tests with soybeans and sweetpotatoes; green manure and size of seed tests and certification work with potatoes; variety, seeding, fertilizer, and harvesting tests with fiber and seed flax, and microscopical studies of flax fibers; pasture research, dealing with fertilizers and limestone for Bermuda-lespedeza pasture production, sources of P. single v. split applications of N for Bermuda grass and Bermuda grass plant studies, and seeding of Alyceclover in grain stubble following various methods of land preparation, and also in permanent pastures; and controlling weeds in small grains with Sinox spray.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 12, pp. 1-4, 5-6, 7-8, fig. 1; 5 (1942), No. 1, pp. 1, 2-3, fig. 1).—Reports of current progress are given in the following articles:

No. 12.—Corn Hybrids and Varieties Evaluated in Yield Tests at 7 Locations in State, by W. H. Freeman (pp. 1-3), and Delta Trials Result in High Corn Yields by Better Hybrids and Adapted Varieties, by P. W. Gull (p. 8). This number also contains brief reports by C. Dorman on agronomic work at substations, including variety tests with cotton, corn and hybrids, oats, wheat, barley, sugarcane (coop. U. S. D. A.), potatoes, soybeans, and miscellaneous forage crops; a trial of Alyceclover; cultural (including planting tests) with cotton, corn, oats, Sudan grass, and lespedeza; fertilizer experiments with cotton, corn, oats, lespedeza, pasture, and summer and winter legumes; other pasture studies; yields of different crops after oats and cotton after various green manures v.

commercial nitrogen; soil improvement crops for corn and cotton; interplanting of corn with legumes; and crop rotations.

No. 1.—Cotton Varieties—Standard, New, and Improved—Tested at Five Locations in State (p. 1); Yields of Cotton Varieties in Tests by Hill Stations, by J. F. O'Kelly (p. 2); and Delta Yields of Standard, New Cotton Varieties, by H. A. York (p. 3).

Crop rotation studies, H. Y. CHEN and A. C. ARNY (*Minnesota Sta. Tech. Bul. 149 (1941), pp. [1]+46*).—Yields of crops grown continuously and in rotations, 1910–39, on Field T at University Farm (E. S. R., 38, p. 825) were compared, and a study made of the influence of rainfall and temperature on crop yields in these cropping systems.

Corn yields in rotations including clover-timothy hay crops usually significantly exceeded those of cropping systems omitting mixed hay crops. Corn in the corn-oat rotation averaged 3.55 bu. more than continuous corn. Yields of corn from the 3-, 4-, and 5-yr. rotations all containing mixed hay crops and manured were not significantly different. Manure in addition to rotations further increased yields. Effects of rotation and application of manure were additive. Oats yields were lower in manured continuous cropping and 2-yr. wheat-oats rotation than in other rotations. Alternating a cultivated crop with oats increased oats yields significantly, but including mixed hay crops in manured rotations did not raise oats yields materially. Manure in the 3-yr. rotation caused an increase of 3.69 bu. Effects of rotation and application of manure on oat yields were not additive. Wheat yields in the 3-, 4-, and 5-yr. rotations exceeded those of continuous wheat and the wheat-oats rotation. Hay yields in the rotations were increased by manure. Total digestible nutrients per acre produced by cropping systems containing corn or both corn and hay averaged higher than those produced by grains only, continuous or alternating with each other. Crop yields from the 3-, 4-, and 5-yr. rotations, all manured, were, in general, not significantly different. Yield differences of crops in these cropping systems were brought about largely in the first 10 yr. or less of operation, but did not change materially after this period.

Deficiency in rainfall in April resulted in reduced hay yields, and if the deficiency extended over both April and May the hay yields were reduced further and oats yields were lowered also. Deficient rainfall in July or in July and August limited corn yields, and if July and August temperatures were also unusually high, a further reduction occurred in yield. Subnormal temperatures during the entire or major part of the growing season resulted in low corn yields. Correlation coefficients indicated that on the average the corn, oats, wheat, and hay crops reacted similarly to precipitation and temperature under the different cropping systems during any given period.

While neither precipitation nor temperature during the growing season, according to the correlation coefficients, limited growth and yields of corn over the 30-yr. period, examination of yields and monthly rainfall and mean temperature for certain years showed that weather during the growing season often affected corn yields materially. Oats yielded highest during cool and moist seasons; cool weather appeared to be more important than high precipitation for oats. Wheat was similar to oats in its climatic requirements. Hay produced highest yields when the weather was cool and moist during its growing period, but contrary to results for oats the precipitation appeared to be more important than temperature to hay crops. For oats, wheat, and hay, precipitation and temperature became increasingly important to yields as the plants approached the flowering period.

Grassland agriculture (*U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 217-218*).—Factors causing and involved in the current trend toward a grassland type of farming in the United States are discussed briefly, with comments on merits of crested wheatgrass and Russian wild-rye; new strains of buffalo grass, Sudan grass, Bermuda grass, alfalfa, red clover, sweetclover, and soybeans; and the value of grass and legume forage and pasture in production of animal products and conserving farm labor, and of legumes in providing N for soil fertility.

Pasture culture in Massachusetts, W. G. COLBY (*Massachusetts Sta. Bul. 380 (1941), pp. 44, figs. 8*).—The historical background of pastures and soils in Massachusetts is reviewed, and an analysis is made of the principal agronomic factors involved in present-day pasture culture and management, i. e., the soil, grazing system, pasture plants, and the climate.

[Legume and inoculation studies in Wisconsin]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 453 (1941), pp. 47-48, 64-65*).—Brief comments are made on the harvesting of clover seed with grain threshers and combines instead of clover hullers, by W. H. Ebling and F. V. Beck; improved culture media for bacteria for inoculating soybeans, by P. and J. B. Wilson and W. W. Umbreit; differences in ability of strains of root-nodule bacteria to fix N in association with different soybean varieties, by Umbreit and S. C. Fan; and similarity of N-fixing systems of root-nodule bacteria and *Azotobacter*, by P. Wilson, C. Lind, S. Lee, O. Olson, J. Wilson, and O. Wyss.

Barley production in Texas, I. M. ATKINS and P. B. DUNKLE. (Coop. U. S. D. A.). (*Texas Sta. Bul. 605 (1941), pp. 35, figs. 9*).—The adaptations, uses, cultural requirements, and diseases of barley in Texas are described, and report is made on results of variety tests at a number of field stations.

Barley fits into the rotation similarly to oats and wheat and is handled with like equipment. As a feed grain it is about equal to corn and grain sorghum but should be ground for livestock. Fall seeding of the Texas variety is recommended in central Texas and Wintex in the north-central part of the State. Spring seeding, less productive, is not advised unless winter-killing occurs. Throughout this area barley produces yields of grain equal to that of corn or grain sorghum, provides winter cover to prevent soil erosion, and produces abundant pasturage for livestock. On the high plains area of the Panhandle, barley may be either fall or spring sown. Fall seeding of Wintex or Tennessee winter types may winter-kill some seasons, but if they survive are more productive than spring-sown barley. In seasons of ample spring rainfall, barley is a desirable spring-seeded catch crop.

Varietal recommendations are Wintex and Texan for all of central Texas, and Wintex for fall seeding in the southern part of the Panhandle and Reno and Michigan Winter for the northern part. Stavropol, Coast, and Flynn are probably the more desirable varieties currently available for spring seeding in the Panhandle. Wintex, developed from a pure line selection of a local barley, and Texan, selected from a bulk hybrid, both by Atkins at the Denton Substation, have been among the most productive varieties from fall seeding at the Denton, Temple, Iowa Park, Chillicothe, Amarillo, and San Antonio Substations. Texas is recommended above Wintex for the Temple area. Both produce high yields of grain and high test weight and are adapted to either fall or spring planting. Texas has the additional advantage of a smooth awn.

Spring oat varieties for Illinois, G. H. DUNGAN, O. T. BONNETT, and W. L. BURLISON (*Illinois Sta. Bul. 481 (1942), pp. 441-471, figs. 7*).—The oats varieties producing the most grain among those grown for 3 yr. or longer in tests in northern Illinois (DeKalb and Mt. Morris) were Marion, Iowar, Albion, Richland, and Gopher; in central Illinois (Urbana) Marion, Columbia, Boone, Kanota,

and Gopher; and in southern Illinois (Alhambra) Bruncker, Columbia, Burt, Markton X Rainbow, and Marion. Columbia could be considered the best all-round variety for southern Illinois until new varieties demonstrated their superiority. Varieties that yielded the most grain in northern and central Illinois usually produced less than average yields of straw. The reverse was true in southern Illinois where the average yield of straw is low. Percentage of groats, shown for several varieties, is deemed a better measure of quality in oats than weight per bushel. Marion averaged highest in yield of groats per acre of any variety in the tests, 1930-41.

Gopher oats drilled at the rate of 8 pk. an acre gave the highest yields. Broadcasting 10 pk. per acre gave as good yields as drilled seeding at this rate. Drilling oats in 16-in. rows resulted in lower yields than drilling them in 8-in. rows, but the wider space between drill rows favored the growth of clover.

Recommended growing practices are outlined.

Influence of temperature on the response of *Arachis hypogaea* L. to day-length. A. I. CHELIADINOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 1, pp. 55-57*).—From the data presented it is concluded that no photoperiodic treatment of the peanut plant will accelerate its development unless temperatures continue favorable during the preflowering period. The number of flowers developed on the short-day plants might be equal to or higher or even lower than on long-day plants, but the ratio of fertilized flowers was always higher on the former. The ratio of fertilized flowers also increased with rise in temperature, the latter being even more effective than day length. The yield of fruit likewise rose with the temperature.

Influence of illumination intensity upon the response of peanuts to daylength. A. I. CHELIADINOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 3, pp. 276-278*).—Two varieties of peanuts were grown under natural and 10-hr. day length and under two degrees of shading, as compared with controls under natural day length and no screening. Toward the end of the growing period, the controls had two to three times the number of blooms, but the treated plants, and especially those on the shorter photoperiods, had far less numbers of underdeveloped pods and genophores than the controls. This was due to the fact that flowering took place earlier and sufficient time and nutrients were present to develop the fruits that had set. Screening with one or even two layers of gauze had no influence on the formation of green weight, which was affected only by the photoperiod, the short-day plants being much lower in green mass than the controls. It is believed that this character of high yields under partial shade can be turned to good account in mixed plantings where sufficient soil nutrients and water are available.

New methods for breaking dormancy in recently harvested potato tubers. T. S. TER-SAAKIAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 31 (1941), No. 2, pp. 165-167, fig. 1*).—According to the method described, the soil in a trench is moistened (but not to the saturation point), filled with newly harvested potatoes from the early crop, and covered with a layer of straw over which a layer of soil, moistened before or afterward, is placed. In such a trench the July temperature was about 25°-30° C. in the Armenian regions where these experiments were conducted, the tubers sprouted in 12-15 days, and, when planted in moist soil, they produced a second high-yielding crop during the same season.

Agricultural seed. A. S. LUTMAN (*Vermont Sta. Bul. 477 (1941), pp. 16*).—Purity and germination guaranties and variations therefrom are tabulated and discussed from tests of 463 samples of field crop seeds and forage mixtures obtained from local dealers in Vermont during 1941.

HORTICULTURE

[**Horticultural studies by the Bureau of Plant Industry**]. (Partly coop. Calif. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1941, pp. 10, 12, 18-19, 20-21, 22, 23, 24-25, 27*).—Included are brief reports of studies upon the possibilities of domestic production of drug plants, promising types of safflower for oil seed production, improvement of hops, varieties of grapes for the southern Great Plains area, harvest sprays for apples, control of biennial bearing in apples by spraying, the potash requirements of peaches, descriptions of four new strawberries, the timing of irrigations in citrus orchards, selection of promising types of tung trees, revitalization of old filbert orchards, breeding of curly top-resistant vegetables, lettuce breeding, tomato breeding, the development of powdery mildew-resistant melons, testing of ornamental shrubs suitable for the central Great Plains, the development of apple and peach rootstocks from domestic sources, refrigeration of citrus under shipment, nutrient requirements of citrus trees, the fertilization of pecan trees, mushroom investigations, and rubber investigations in Latin America.

[**Horticultural studies by the Georgia Station**] (*Georgia Sta. Rpt. 1941, pp. 129, 130, 131-134, 137-138, 141-144, figs. 4*).—Included are brief statements of progress on squash and collard breeding, fertilization and spacing of asparagus, use of starter solutions for pimiento peppers, factors affecting the longevity of peaches, cover crops for peach orchards, growth of peach roots, rootstocks for northern-type grapes, varieties of strawberry and bramble fruits, and varieties of dahlia.

Studies reported from the Mountain Substation include the culture of herbs; variety tests of peaches, cherries, and grapes; the effect of Korean lespedeza cover crops on grapevines; fertilization and culture of Tendergreen beans; fertilizer and variety tests with cabbage; fertilizer and cultural tests with tomatoes; and varieties, culture, and fertilizers for lettuce.

Varieties and culture of fruits and vegetables, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 12, pp. 4-5, 5, 6*).—Information is presented on the yields of bean, tomato, peach, apple, and pear varieties and on the results of spacing and pruning tests with tomatoes at the Delta Substation and upon fertilizer studies with cabbage and string beans at the South Mississippi Substation.

[**Horticultural studies at the Truck Crops Substation**], C. DORMAN (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 12, pp. 6, 7*).—Included are brief reports on variety and fertilizer studies with cabbage and cauliflower; variety, breeding, and fertilizer trials with tomatoes and English peas; and varieties and breeding of snap and lima beans and sweet corn.

Relation of certain air temperatures and humidities to viability of seeds, L. V. BARTON (*Contrib. Boyce Thompson Inst., 12 (1941), No. 2, pp. 85-102, figs. 5*).—Various species of seeds were subjected to four constant temperatures, 5°, 10°, 20°, and 30° C., with relative humidities of 35, 55, and 76 percent at each temperature. In order of increasing water absorption were the peanut, lettuce, flax, pine, tomato, and onion. With a relative humidity of 35 percent seeds absorbed about the same amount of water at 5° and 10°, but in every case less water was absorbed at the higher temperatures of 20° and 30°. At 55 and 76 percent relative humidity, the peak of moisture absorption was at 10° and the lowest at 30°. Seeds of high initial vitality were much more resistant to unfavorable environments than those of low vitality. Deterioration, once under way, proceeded rapidly under unfavorable storage conditions. Seeds stored in the open laboratory attained a moisture content in August approximately

double that of midwinter. Such changes are believed to contribute to the deterioration of seeds in open storage.

Effect of several growth substances on vegetable crop plants, E. C. MINNUM. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 477-478).—Treatment of the seeds and plants of various vegetable crops with certain of the indole acids in the form of dusts and aqueous solutions resulted in no benefit and in some cases was harmful.

Lanolin emulsions as carriers of growth substances, R. L. WINKLEPLECK and J. A. McCLINTOCK. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 94-96).—Information is presented on the preparation and use of lanolin emulsions for the stimulation of root formation in cuttings. Triethanolamine was found a very satisfactory emulsifying agent, both from the standpoint of ease of preparation and stability of the finished emulsion. A formula that will produce a smooth, nearly white emulsion which remains stable almost indefinitely at room temperature required 38 gm. of lanolin, 7.5 gm. of stearic acid, 2.7 gm. of triethanolamine, and 100 gm. of distilled water. The growth-promoting substance should be dissolved in a suitable solvent and the solution added slowly to the emulsion with constant stirring.

Effect of vitamin B₁ on the yield of several vegetable crop plants, E. C. MINNUM. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 475-476).—None of several treatments applied in connection with starter nutrient solutions to various vegetable crops grown at Ithaca and near Albany, N. Y., had any significant effect on growth. The author suggests that cold, wet weather in May and June may have been a factor in the negative results.

Further tests with vitamin B₁ on established plants and on cuttings, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 143-156, figs. 3).—China-aster plants growing in flats during February and March produced somewhat taller plants of greater fresh weight when supplied weekly with a solution of vitamin B₁. Potted plants supplied B₁ in June and July showed no response. Application of B₁ every 3 to 5 days to the sand in which various species of cuttings were placed did not accelerate the development of roots. In a few cases vitamin B₁ appeared to increase the activity of indolebutyric acid. The results suggested that vitamin B₁ should not be recommended for practical use in treating cuttings or as a soil amendment.

Probable causes for the difference in facility of producing parthenocarpic fruits in different plants, F. G. GUSTAFSON (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 479-481, figs. 2).—Upon extraction with ether or methanol, the more compact ovaries of the tomato, pepper, and cucumber were found to contain more native auxin than ovaries of the more bulky and watery squash, pumpkin, and watermelon. Since crookneck and Buttercup types of squash produced parthenocarpic fruits with chemical treatment, the author concludes that at present it cannot be said that there is any relation between natural auxin of the ovary and the ease with which parthenocarpy may be induced. Of the four chemicals used, naphthaleneacetic acid was the most effective.

Breeding better vegetables for the South (U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 219-220).—Recent progress at the Regional Vegetable Breeding Laboratory at Charleston, S. C., is referred to.

First need of early greens is nitrogen, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 12, pp. 1, 8).—Significant increases in the yield and quality were obtained from early spring applications of nitrate of soda to spinach. In the spring of 1938 the yields from the plats with no fertilizer, with 300 lb. of nitrate of soda per acre, and with 240 lb. of ammonium sulfate per acre were, respectively, 1,200, 10,200, and 8,000 lb. per acre. Apparently

after winter leaching the soil is particularly low in nitrates and responds readily to application of nitrate fertilizers.

Effect of boron on plant growth and dry seed yield in lima bean (*Phaseolus Lunatus* L.), R. E. WESTER and R. MACRUDER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 472-474).—Applications 1 week before bloom of boric acid at the rates of 5, 10, and 15 lb. per acre to lima beans growing on a well-drained gravelly loam soil, fertilized liberally with commercial materials, resulted in significant increases in yield of dry beans in the 10- and 15-lb. treatments. The maximum yield of dry beans was produced on the 15-lb. plat. There was no significant effect on stand of plants or on the green weight of plants. Determinations at the end of the season of the pH of the soil showed no significant differences related to boric acid treatment.

Wisconsin sweet corn canning trials, W. B. ENNIS, R. H. ANDREW, and N. P. NEAL (*Canning Age*, 22 (1941), No. 13, pp. 612-613, 632).—Tabulated information is presented on the results of trials of the principal varieties and hybrids of sweet corn tested in 1941.

Sweet corn in Alberta, J. S. SHOEMAKER and C. WALKOF (*Alberta Univ., Col. Agr. Bul.* 38 (1941), pp. 75, figs. 21).—Comprehensive information is presented on the botany and history of sweet corn, types and varieties, hybrids and their production, characteristics of the corn plant and ear, pollination processes, climate and soil requirements, culture, picking maturity, seed production, breeding, food values, etc.

New corn hybrids, W. R. SINGLETON. (Conn. [New Haven] Expt. Sta.). (*Canning Age*, 22 (1941), No. 12, pp. 559-560, figs. 4).—In this account of sweet corn breeding activities, the author discusses certain new promising hybrids with respect to their parentage, plant and ear characteristics, quality, and potential uses.

Crisp-head lettuce in Florida.—A preliminary report, J. R. BECKENBACH, F. S. JAMISON, R. W. RUPRECHT, and F. S. ANDREWS (*Florida Sta. Bul.* 365 (1941), pp. 19, figs. 5).—Of a number of crisp-head strains of lettuce tested on several soil types in the State, Imperial No. 44 was found most promising because of a lower tendency to bolting and a capacity to form marketable heads under Florida conditions. The nitrogen requirements for the crop when grown on sandy soils ranged from 60 or 90 lb. of actual nitrogen per acre. Requirements for phosphorus and potassium were highly variable, dependent upon the conditions and the previous use of the soil. Sulfate of ammonia and urea were good nitrogen sources for slightly acid or alkaline soils. Natural organics, such as Milorganite and guano, that decompose fairly rapidly were excellent when not more than 40 percent of the total nitrogen was derived from such sources. Natural organic materials, such as castor pomace, were not found desirable because lettuce is a short-season crop and is grown during relatively cold weather when microbiological activity is relatively slow. As a result of a spacing experiment with Imperial 44 lettuce, it is recommended that such lettuce should not be set closer than 14 by 14 in.

The effect of culture solution temperature on water intake and wilting of the muskmelon, G. J. RALEIGH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 487-488).—Delicious muskmelon plants were grown in cultural solutions held in Pyrex jars surrounded by water maintained at 50°, 65°, and 80° F. The air temperature was held at approximately 90°. Plants with roots at 50° wilted badly and those at 65° drooped slightly. The plants in the three groups used an average of 47, 160, and 285 cc. of solution, respectively, in 1.5 days.

Nodulation and dry weight of garden peas as affected by sulfur and sulfates, H. Z. GAW and P. N. SOONG (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 1, pp. 100-103).—Garden peas growing in pots of washed river sand and inoculated about the time of germination with pure cultures of nodule bacteria were supplied with different sulfates in addition to the basic nutrient solution. Calcium sulfate and iron sulfate increased nodule production and dry weight; ammonium sulfate increased dry weight but not nodulation; sodium sulfate and zinc sulfate increased nodulation but did not affect dry weight; and copper sulfate, chromium sulfate, and potassium sulfate depressed nodule formation and dry weight. Sulfur in its elemental form stimulated nodule production but depressed dry weight slightly.

Some effects of calcium and pH upon spinach, R. A. SCHROEDER. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 482-486).—Long Standing Bloomsdale spinach was grown at five calcium levels at pH 5.2 and pH 6.8. The addition of increasing amounts of calcium to the quantity of calcium on the original subsoil resulted in an increase in both total fresh weight and dry weight. Both weights were significantly greater in the pH 6.8 than in the pH 5.2 series. The calcium in 19 gm. of dry weight increased as calcium was added, particularly in the pH 5.2 series. The total amounts of calcium in the crop increased as calcium was added. The amount of phosphorus in 10 gm. of dry weight increased with calcium additions up to the point where 6 milliequivalents per plant were added. The peak of phosphate content at pH 5.2 was 22 percent greater than the peak at pH 6.8. The total potassium content in the crop increased as calcium was increased in both pH series. The total quantity of magnesium and strontium was increased as the calcium was increased. The total amount of manganese in the crop was definitely increased by calcium additions at the pH 5.2 level but very slightly decreased at the pH 6.8 level.

Studies of the tomato in relation to its storage.—II, **The effects of altered internal atmosphere upon the respiratory and ripening behavior of tomato fruits stored at 12.5° C.**, K. A. CLENDENNING (*Canad. Jour. Res.*, 19 (1941), No. 12, Sect. C, pp. 500-518, figs. 19).—In this second paper of the series (E. S. R., 79, p. 480), the author reports that the so-called anomalous type of respiration, in which stored tomatoes ripened slowly and unevenly without an attendant rise in carbon dioxide output, was observed in fruit of plants grown at different seasons and under different light intensities in a single season. The condition was induced also by the careful sealing of the stem end scar with hot paraffin wax. When the wax was removed, there was a return to normal ripening and respiratory behavior. Waxed tomatoes were found subject to several physiological disorders, and if waxing was done when the tomatoes were in the yellow or yellow-orange stage they became soft and highly susceptible to fungal attack before attaining full color. It is suggested that wax should be applied before ripening has commenced if softening is to be avoided. In fact, the author deems it inadvisable under the present status of knowledge to recommend wax applications to the stem scars as a commercial practice, but suggests that tomatoes may be held satisfactorily for 5 weeks by storing at the mature green stage with the stems attached, at a temperature of 10°-12.5° C. and at a relative humidity of 80-85 percent.

A physiological study of growth and fruiting of the tomato, *Lycopersicon esculentum*, with reference to the effect of certain climatic and edaphic conditions, H. L. STIER (*Md. Univ. Off. Pub.*, 37 (1940), No. 9, pp. 35, 36).—An abstract of a doctorate thesis.

Extra care to orchard after the '41 crop, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 1, pp. 1, 3).—Information is presented on the

winter and early spring care of fruit trees, particularly dormant spraying, pruning, fertilization, and control of borers.

Cultural practices for young apple trees, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 181-183).—Inclusion of a 12-qt. pail of moist peat, with the soil placed about the roots of 1-yr. McIntosh and Baldwin trees at the time of planting had no significant effect on their growth in the first 2 seasons following setting as compared with similar trees given cultivation only. The best development, as indicated by trunk girth and shoot growth, was in trees mulched with 3 to 4 in. of rye straw and nonlegume hay. Trees in unfertilized pastures and in quackgrass made the poorest growth of all. Clean cultivation plus a cover crop of winter rye was next to the best. No fertilizer was applied in any case, and no pruning was done.

The influence of leaf-fruit ratio on alternate bearing in the apple, T. SHEN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 127-132).—Thinning experiments carried on for two successive years on ringed branches of McIntosh, Red Delicious, Golden Delicious, and Wealthy trees showed in the first season a highly significant correlation between leaf-fruit ratio and fruit bud differentiation in three of the varieties. It was evident that somewhere between 700 and 1,399.9 cm.² of leaf area per fruit there is a point beyond which further increase in leaf area does not increase fruit bud differentiation. There were varietal differences in the optimum ratio. After July 10, thinning of fruit had no effect on fruit bud differentiation. In the second year, using the same branches, fruit bud formation was little influenced by leaf-fruit ratio and earliness of thinning. The author suggests that, even with a second ringing, the composition of the branches was probably not comparable to that of unringed branches. Possibly nitrogen was deficient in the ringed branches. It is suggested that the amount of bloom in the second season had a greater influence on fruit bud formation than any other factor. Apparently leaf-fruit ratios, which are chiefly concerned with carbohydrate supply, are not always the deciding factor in fruit bud formation. Water, nitrogen, and perhaps some unknown substance may become more important.

Relative carbohydrate and nitrogen concentration in new tissues produced on ringed branches, A. E. MURNEEK. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci., Proc.*, 38 (1941), pp. 133-136, figs. 3).—Studies of the composition of spurs collected at different dates from ringed and unringed branches of Rome Beauty and Ingram apple trees showed that despite the increased set of fruit on the ringed branches the comparative concentrations of starch, sugars, and nitrogen in the flowers or fruit and in the current season's growth (exclusive of leaves) all followed the usual seasonal changes for such substances. The actual content of carbohydrates was higher and that of nitrogen lower in both fruit and spurs of ringed limbs. In the case of late-ringed Rome Beauty limbs, the differences were small or absent, yet fruit setting was increased just as much as by early ringing. Carbohydrate accumulation is apparently associated with the growth and development of the apple from a period when the second or third drop occurs until the time of fruit maturity. Immediately following pollination and fertilization, fruit setting and development are greatly influenced by nitrogen. It is suggested likely that growth substances of some kind may be the real regulatory agents and that nitrogen, carbohydrate, and other foods may serve merely as substrates for these materials. Ringing may cause a retention of such growth substances above the wound.

Effect of scoring and of a-naphthyl acetic acid and amide spray upon fruit set and of the spray upon pre-harvest fruit drop, C. L. BURKHOLDER and M. McCOWN. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941),

pp. 117-120).—In May 1940, 14-year-old Starking apple trees, which had failed to set a full crop of fruit up to that time, were subjected to two treatments—scoring, and spraying when in full bloom. The scoring treatment resulted in only slight increases in the percentage of clusters setting fruit. Moderate decreases in set followed the application of full-blossom sprays containing 0.001 percent of α -naphthylacetic acid or 0.005 percent of α -naphthylacetamide. A very heavy decrease in set followed the use of a 0.005 percent α -naphthylacetic acid on open flowers and was accompanied by serious injury to leaves. No injury was observed on trees receiving the 0.005 α -naphthylacetamide spray, and some injury occurred from the 0.001 percent α -naphthylacetic acid. The use of harvest sprays materially reduced the dropping of mature fruit from Rome Beauty and Delicious trees, but no very significant results were obtained with McIntosh and Jonathan. The fact that varieties in which the initiation of abscission in bark tissues generally precedes pith abscission respond most readily to preharvest sprays suggests an important relationship between the manner of abscission and the reaction to such sprays.

The use of naphthaleneacetic acid and its derivatives for preventing fruit drop of apple, A. E. HITCHCOCK and P. W. ZIMMERMAN (Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 104-110, figs. 2).—In trials with five varieties of apples, preharvest sprays gave good results in reducing dropping in some cases but not in others. Besides the varietal factor there were differences between trees of a single variety and between branches of a single tree. None of the derivatives of naphthaleneacetic acid used was noticeably more effective than the others. Concentrations of 25-50 mg. per liter appeared no more effective than concentrations of 7.5-15 mg. per liter. The season of 1940 was favorable for the early coloring and maturing of red-fruited apples, such as McIntosh, Stayman Winesap, and Baldwin, and the crop could have been harvested in most cases before a 20-percent drop occurred. It is suggested that the cool weather, although favorable for early coloring, may have limited the action of growth-reducing substances in limiting drop.

Spraying for control of pre-harvest drop of apples in New Mexico, J. V. ENZIE and G. W. SCHNEIDER (Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 99-103).—In 1 year's experiments on 14-year-old Stayman Winesap trees, both naphthaleneacetic acid and naphthaleneacetamide, used at the approximate strength of 0.001 percent, were effective in delaying the preharvest dropping of fruit. The naphthaleneacetic acid was the more effective substance of the two. The materials were effective for a period of at least 15 days after the first application. A second spray was not as durable, possibly because of lower prevailing temperatures. The sprays were effective in reducing the drop of codling moth-infested apples, but not to the extent that handling costs were appreciably increased.

Further studies with sprays in controlling pre-harvest drop of apples, L. P. BATJER and P. C. MARTH. (U. S. D. A.) (Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 111-116, figs. 3).—In experiments with Williams apples hormone sprays were highly effective in retarding dropping, but it was noted that if the fruits were not harvested within a day or two after they would have dropped normally they became overripe and mealy. Naphthaleneacetic acid and naphthaleneacetamide were the only materials found highly effective. Sodium thiocyanate produced the only noticeable effect on color, the fruit having a decided pinkish cast. This chemical hastened maturity and also caused some spray injury in the form of brown flecks on the apples. One spray of naphthaleneacetic acid gave good results with McIntosh, the effects lasting for from 10 to 12 days when the spraying was accurately timed. Good results were obtained with Delicious

and Stayman Winesap, but not with York Imperial and Rome Beauty where dropping was severe despite the sprays. In Stayman Winesap and Delicious water core became a serious factor if the fruits were not harvested soon after the normal harvesttime. Apparently, with many varieties, preharvest sprays will have their greatest value in preventing dropping losses before and during the normal harvest period.

Harvest sprays in Ohio, 1940, C. W. ELLENWOOD and F. S. HOWLETT. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc.*, 74 (1941), pp. 67-73).—In the fall of 1940 five commercial materials, all having naphthaleneacetic acid as the active agent, and a home-made mixture with the same base were compared as preharvest sprays for Jonathan and Stayman Winesap trees. In one of the materials naphthaleneacetamide was used to supplement the naphthaleneacetic acid. No consistent differences were found between the several materials. Time of spraying was highly important, as indicated by the fact that Jonathan trees sprayed on October 4 dropped no more apples than did trees sprayed twice, September 27 and October 4. Unfavorable results were obtained with the Baldwin apple, apparently due to premature dropping of leaves as a result of leaf spot injury. Observations on McIntosh trees indicated that the delay in harvest from spraying permitted an improvement in the color of the fruit. Thorough and timely spraying was essential to success.

Some responses of apples in storage to plioilm liners and wrappers, H. H. PLAGGE and T. J. MANEY. (Iowa Expt. Sta.). (*Ice and Refrig.*, 101 (1941), No. 2, pp. 201-205, figs. 2).—The packing of Jonathan and Starking apples in plioilm-lined boxes resulted in a fairly constant, though not very high, concentration of carbon dioxide within the package over a 4-mo. storage period. This was sufficient to influence the metabolism of the fruit as measured by differences in appearance, firmness, and taste. Jonathan apples, after storage, were firmer, brighter in color, and much less affected by Jonathan spot than were check fruits in paper-lined boxes. Starking apples, on the contrary, were mealy after storage in plioilm and were in prime condition in the paper-lined boxes. At 31° F. the plioilm wrappers reduced the amount of soggy break-down in Winter Banana apples and delayed their ripening, while at 35° the amount of scald was reduced but ripening was not retarded. The wrappers increased the amount of scald in Paragon and York Imperial apples at 35°. When oiled papers were used with plioilm, the tendency toward scald was lessened. Jonathan apples, overmature at picking, had less scald when wrapped in plioilm, but not to an extent for commercial control.

Extent of colored area on Elberta peaches in relation to leaf area per fruit and to fruit size, C. F. KINMAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 191-192).—Fruits of branches ringed a few days after petal-fall were thinned to ratios of 10, 20, 30, 40, and 60 leaves per fruit. The ringed surfaces were kept open during the season. Measurements of the solid red areas on the fruits harvested when eating-ripe or nearly so showed an inverse relationship between color and leaf area. For example, the percentage of red area was approximately one-third as great for fruits with 60 leaves as for those with 10 leaves. The average weight of fruits with 60 leaves was three times that of fruits with 10 leaves. Covering fruits with black cloth inhibited red color formation, both on ringed and unringed branches.

Sortenkundliche Untersuchungen an Prunus domestica [Horticultural varieties of Prunus domestica], K. RÖDER (*Kühn-Arch.*, 54 (1940), pp. 1-132, figs. 155).—Herein are presented the results of an intensive study of the flowers, fruit, leaves, 1-yr. shoots, tree form, and roots of a large number of European plums and prunes. Among characters found highly constant and of great

value in distinguishing varieties were the form and markings of the pit or stone and the form of the buds on dormant 1-yr. shoots. The stone, the fleshy part of the fruit, the flowers, and the dormant 1-yr. shoots were sufficient for identifying varieties.

Use more mulch on everbearers, W. G. BRIERLEY. (Univ. Minn.). (*Minn. Hort.*, 69 (1941), No. 7, p. 130).—The exposure of potted strawberry plants to below freezing temperatures, after being allowed to mature and harden, showed more killing of autumn-fruiting kinds at the four temperatures used, i. e., 10°, 16°, 21°, and 27° F., than of the June-fruiting varieties. The reduced resistance of the autumn bearers is attributed to the fact that autumn fruiting lessens the quantities of reserve foods and probably delays maturity in other directions.

Control of grape diseases and insects in eastern United States, J. B. DEMAREE and G. A. RUNNER (*U. S. Dept. Agr., Farmers' Bul. 1893* (1942), pp. II+28, figs. 21).—This supersedes Farmers' Bul. 1220 (E. S. R., 46, p. 235).

Effect of mulches and fertilizers on yield and survival of the dryland and highbush blueberries, A. KRAMER, E. L. EVINGER, and A. L. SCHBADEB. (Md. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 455-461).—Six mulching and cover crop treatments in 1939 and four fertilizer treatments in 1939 and 1940 were carried out with varieties of highbush blueberries and with naturally occurring plants of the dryland blueberry. Mulching decreased the survival of dryland blueberries, but increased the yield of both highbush and dryland plants. Peat mulch was particularly effective in increasing yield and root growth. Ammonium sulfate and complete fertilizer had little effect on increasing survival, but did improve yields. Burying the mulch, especially peat, alongside the roots improved survival and yield. Peat-sawdust mulch and lespedeza gave the best control of erosion, but lespedeza decreased blueberry yields.

The effect of soil temperature on the growth of cultivated blueberry bushes, J. S. BAILEY and L. H. JONES. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 462-464, fig. 1).—Observations on nursery-grown Rubel blueberry plants placed in containers of soil, the temperature of which was held constant at desired points, showed that soil temperature influenced greatly the growth of plants, despite the fact that the air temperature was favorable. At the minimum soil temperature of 55° F., there was wilting of the tops at first but within a few days the plants became adjusted. In general, the average height and average total linear growth increased with rise in temperatures up to the maximum temperature used—90°. Above 65° the plants appeared to grow tall and upright in habit, and below 65° they were short and spreading.

The limitations of *Chaenomeles lagenaria* *Wilsonii* as a horticultural plant, G. L. SLATE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 471).—Because the plants were lacking in hardiness and were unproductive and the fruits had little value in jelly making, the author concludes that the species has very limited economic importance.

El cultivo del cacao [The culture of cacao], E. LLANO GÓMEZ (*Agricultura [Bogotá]*, 12 (1940), No. 24-25, pp. [1]+847-922, pls. 5, figs. 13).—This manual on cacao culture includes data on the diseases and insect pests and their control.

El cultivo del cacao y sus proyecciones económicas en el oriente de Caldas [Cacao culture and its economic promotion in the east of Caldas], G. HENAO LONDOÑO (*Rev. Agropec. [Colombia]*, 6 (1941), No. 26, pp. 55, figs. 8).—This is a general conspectus on cacao, its geographical distribution, varieties, soil and climatic relations, culture in all its phases, and diseases and pests and their control.

Natural pollination of cocoa, *Theobroma leiocarpa*, on the Gold Coast, A. F. POSNETTE (*Trop. Agr. [Trinidad], 19 (1942), No. 1, pp. 12-16*).—That insects are the important pollinating agents for cacao in the Gold Coast plantations was indicated in 3 years' experiments. In periods of profuse bloom only about 10 percent of the flowers were pollinated, while in periods of limited bloom the percentage reached 79. The relative number of available insects appeared to be the controlling factor. By means of cages and banding, it was ascertained that only one of the five species of ants present was capable of pollinizing cacao flowers. Apparently flying insects were responsible for a large part of natural pollination. By covering blooms for different parts of the day, it was established that the active pollinator does not fly at night.

Fertilizer experiments in an orange grove in the eastern Everglades, J. R. NEELES and W. L. FORSEE, JR. (Fla. Expt. Sta.). (*Citrus Indus., 22 (1941), No. 12, pp. 6-7*).—In experiments with Lue Gim Gong oranges growing near Fort Lauderdale on a fibrous peat soil underlaid with porous marl rock, a benefit from phosphorus was found in the form of increased yields and in improved characteristics of the fruit. The oranges from the no-phosphate plats were softer and more acid when picked and the rinds were measurably thicker than in fruit of phosphated trees. A tendency was noted also for greater dropping of fruit from the nonphosphated trees. The largest-sized fruits were obtained from the high-potassium plats. Certain deficiencies, such as zinc, manganese, and copper, were observed and corrected during the experiment.

The starch cycle in the Hachiya persimmon, C. J. ARCHER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 187-190, figs. 2*).—A study of the starch cycle in bearing and nonbearing trees from November 1938 to May 1940 revealed that the normal cycle is similar to that occurring in other deciduous trees. No definite wavelike accumulations and disappearances of starch were observed between the three ages of branches analyzed or within the tissues of the same age branches. The normal starch cycle reflected general growth activities in the tree except during the rapid decrease to the winter minimum. Fruiting suppressed starch accumulation, and evidence was obtained that fruit development is probably cyclic rather than uniform.

Compilation of data on nut weight and kernel percentage of black walnut selections, L. V. KLINE and S. B. CHASE (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 166-174*).—Information is presented, largely in tabular form, on 335 samples representing a total of 212 selections.

Tung tree investigations, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 12, p. 6*).—Information is presented on the results of training and pruning studies with tung trees at the South Mississippi Substation and on fertilizer, propagation, and pruning studies with tung trees at the Tung Experimental Field.

China tung oil and its future, C. C. CHANG (*China Veg. Oil Corp. Leaflet 8 [1940], pp. [5]+129, pl. 1, figs. 24*).—The status of tung oil production in China is discussed with reference to culture, handling of the product, trade, competition from abroad, competing oils and synthetic substances, etc.

Cinchona cultivation and the production of totaquina in the Philippines, J. MABAÑON and H. H. BARTLETT (*Univ. Philippines, Nat. and Appl. Sci. Bul., 8 (1941), No. 2, pp. 111-142, pls. 23*).—The history of *Cinchona* culture and totaquina production in the Philippines is presented, and an account of experimental studies is given, including plantings of five species. Detailed instructions on planting methods found successful are given, and some important disease problems are discussed. Studies of the therapeutic efficacy of Philippine totaquina are

said to have shown that it compares favorably with quinine, and no untoward effects have been observed.

Lily culture, L. H. McDANIELS ET AL. (*Amer. Hort. Soc., Lily Bul., 1941, pp. 23, figs. 5*).—Information is presented on propagation, culture, winter protection, control of virus and other diseases, resistance to cold, uses, etc.

Maintenance of shade and ornamental trees, P. P. PIRONE (*New York: Oxford Univ. Press, [1941], pp. XVII+422, figs. [175]*).—Prepared by a plant pathologist of the New Jersey Experiment Station, this book presents information on the normal growth of trees, planting, fertilization, pruning, treatment of wounds, species and their utilization, control of insects and pests, prevention and treatment of nonparasitic injuries, and the specific pests of various trees.

FORESTRY

Forest activities under the impact of war (U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 205-209).—Information is presented on the lumber and pulpwood demands resulting from war needs; the work of the Forest Service and cooperating agencies in the establishment of shelterbelts, in aiding farmers in improvement of their woodlands, and in protecting forests from fire; the work of the Forest Products Laboratory on wood and wood products utilization; forest conservation activities; the extension of the public forests; etc.

Twenty years of forest research in the lower South, 1921-1941, E. L. DEMMON. (U. S. D. A.). (*Jour. Forestry, 40 (1942), No. 1, pp. 33-36*).—This is a brief review of the progress of forestry in the two decades since the establishment of the Southern Forest Experiment Station on July 1, 1921, supplemented with a preview of the immediate future.

Report on experimental planting, Syracuse Forest Experiment Station, R. P. PRICHARD (*N. Y. State Col. Forestry, Syracuse Univ., Bul., 14 (1941), No. 3-c, pp. 43, figs. 9*).—Data are presented on the growth rates and behavior of various species and combinations of species established in the experimental forest located within the limits of the city of Syracuse.

Comparative anatomy and varying physical properties of trunk, branch, and root wood in certain Northeastern trees, A. C. FEGEL (*N. Y. State Col. Forestry, Syracuse Univ., Bul., 14 (1941), No. 2-b, pp. 20*).—Observations on a total of 20 species growing on various sites in the Adirondack region revealed that wood of the highest and lowest specific gravity occurred in branches and roots, respectively. Shrinkage in drying was greatest in the branch and least in the root wood. The branches grew more slowly than the roots, and the trunks showed the most rapid development. Branch wood was stronger in compression perpendicular to the grain than was either trunk or root wood, and material from the roots was much weaker. The branches were strongest in compression parallel to the grain when green, and the roots weakest. Root wood was inferior in both the green and air-dry states. Trunk wood was superior to both root and branch wood in stiffness and bending strength. Information is presented on fibers, tracheids, resin canals, wood rays, etc.

Some effects of incomplete girdling of northern hardwoods, M. WESTVELD. (U. S. D. A.). (*Jour. Forestry, 40 (1942), No. 1, pp. 42-44*).—Of 118 trees girdled in 1929 on experimental plats in the White Mountain National Forest, 36 percent developed bridges of varying widths. A number of the bridged trees died later, so that by 1940 there was only 24 percent of living trees. The method of girdling was a factor in the tree's response. The lowest initial success was attained under the notching system, whereby two-thirds of the trees developed bridges. However, in 1940 there were 35, 33, and 12 percent of surviving trees

under the hacking, notching, and peeling methods, respectively. Of the four species—yellow birch, beech, red maple, and sugar maple—which developed bridges, the heaviest early mortality occurred in the yellow birch. None of the bridged sugar maples died following girdling, and this species was outstanding in its capacity to develop new callus growth.

Response of American elm to loose and briquette fertilization in the greenhouse, J. K. MELVIN and A. L. McCOMB. (Iowa Expt. Sta.). (*Jour. Forestry*, 40 (1942) No. 1, pp. 49-51, fig. 1).—Eight fertilizer treatments, four with loose- and four with briquette-type materials, were tested on seedling American elms growing in boxes in the greenhouse in an acid infertile clay subsoil of the Lindley series. Records taken at the end of 5 mo. showed the greatest development in the trees receiving loose superphosphate and sulfate of ammonia. The average total height of this lot was 19.08 in. as compared with 6.02 in. for the next best treatment, that of loose superphosphate alone. No response was obtained with rock phosphate or ammonium sulfate used alone in loose form. None of the briquette treatments were effective, due apparently to the failure of the roots to reach the briquettes. Phosphorus was the most limiting element, and nitrogen became effective once the phosphorus requirements were satisfied.

Pruning southern pines, W. R. MATTOON (*U. S. Dept. Agr., Farmers' Bul. 1892* (1942), pp. [2]+34, figs. 25).—The principles and practices of pruning pine trees are discussed, with special reference to the benefits of pruning, tools and their use, methods of pruning, selection of trees, costs, etc.

Early effects of pruning in a young shortleaf pine planting, W. H. CUMMINGS. (*U. S. D. A.*). (*Jour. Forestry*, 40 (1942), No. 1, pp. 61-62).—Four yr. after setting in plantation form, shortleaf pines were pruned of all side branches up to one-half their height. Measurements in the next 2 yr. showed that diameter growth at 1.5 and 4.5 ft. was decreased markedly by pruning. Height growth and diameter at 7.5 ft. were not significantly affected. Lower values for taper at 4.5 ft. indicated that pruning favored the development toward a more cylindrical form of the basal section of the stem.

Unmerchantability in second cut ponderosa pine, W. L. CHAPEL (*U. S. D. A.*). (*Jour. Forestry*, 40 (1942), No. 1, pp. 45-48, fig. 1).—During the second cutting in 1939 in an experimental area in the Fort Valley Experimental Forest, Ariz., logged originally in 1909, careful records were taken on the volume of defective and unmerchantable logs and of the factors responsible for unmerchantability. There was 10.8 percent of unmerchantable logs, a figure much lower than commonly found in first cuttings. Unmerchantability increased directly with the age and diameter of a tree and its decline in vigor. Since unmerchantability does not become serious until a tree reaches the classes of greatest age (class 4), and poorest vigor (class D), the author suggests the desirability of technical rotations for the various products harvested from ponderosa pine before the trees reach these classes and before any decline in periodic increment occurs.

Studies on the relation of growth rate to wood quality in Populus hybrids, L. P. V. JOHNSON (*Canad. Jour. Res.*, 20 (1942), No. 1, Sect. C, pp. 28-40).—Experiments were conducted on the relation of growth rate to wood quality in a series of 43 hybrid and parental trees, which involved *P. alba*, *P. grandidentata*, and *P. tremuloides*. Fibers in fast growth annual rings were longer on the average than those in slow growth rings from the same tree. In single annual rings, fibers of early wood were shorter and thicker than those of late wood. Average fiber diameter of individual trees was significantly correlated in a positive manner with growth rate, but the correlation between fiber length and growth rate was well below the level of significance. Short, thick habit of growth was significantly correlated with high density of wood, but correlations between

growth rate (in terms of annual increment in volume) and wood density were insignificant. Pulp and paper tests did not reveal any very striking differences in quality between fast-growing hybrid and slow-growing parental trees, although there remains some doubt as to the suitability of abnormally fast-growth hybrid wood for some of the higher grades of soda pulp paper.

A bisexual cone of white spruce, S. PAULEY. (Mich. State Col.). (*Jour. Forestry*, 40 (1942), No. 1, pp. 62-63, fig. 1).—A record is presented of the discovery of a single bisexual cone on a *Picea glauca* (= *canadensis*) tree growing on the campus of the Michigan State College.

Relation of naval stores yields to frequency of chipping, T. A. LIEFELD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 2, pp. 81-92, figs. 5).—A study of the output from three chipping treatments, (1) customary seasonal chipping, (2) moderate year-round practice, and (3) heavy year-round practice, led to the conclusion that frequent chipping has distinct advantages when rapid exploitation and high annual or seasonal production are desired. It was evident that chipping frequencies should not exceed three times a week during the summer nor every other week during the winter. Where long working life of the same faces or trees is considered more important than high production per year, the results pointed to a schedule of semiweekly chipping in summer, weekly chipping in the spring and fall, and semimonthly during the winter. Even in the most conservative work, loss of gum would result if streaks were chipped less frequently than every 2 weeks in summer and every 6 to 8 weeks in winter. If varying intervals between chippings are out of the question, the results indicate the desirability of weekly chipping from March to November and every other week during the winter, or, for longer working life, a rigid schedule of chipping every other week throughout the year.

Rubber program makes headway (U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 215-217).—Information is presented on the progress of the cooperative Latin-American rubber program, the development of synthetic rubber, and the utilization of guayule as a source of rubber.

An inexpensive planimeter, L. M. DICKERSON. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 1, pp. 19-22, figs. 3).—The construction and operation are discussed.

Circular slide rules for solving linear equations, J. H. BUELL. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 1, pp. 26-32, figs. 4).—This article discusses the advantages of the circular rule for field use and gives a detailed example of the construction of such a rule.

Michigan log marks, edited by C. ALLEN (*Michigan Sta. Mem.* 4 (1941), pp. [1]+89, figs. 937).—A brief narrative account, compiled by the Works Progress Administration, is presented of the logging of the Michigan virgin white pine forests, together with a description of the marks used for distinguishing the logs of different operators and owners.

DISEASES OF PLANTS

[Phytopathological research by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1941, pp. 5, 15, 16-18, 19, 24, 25-26, 32-33, 34-35).—Brief reports of progress (E. S. R., 84, p. 768) are given on some of the more important recent findings of the Bureau, including data on a new disease, charcoal rot (*Sclerotium bataticola*), which is taking a heavy toll of the sorghum crop; seed treatment found for controlling head smut and stripe smut of various grasses; necessity for prompt use of chemicals in control of stain fungi in lumber indicated; predictions of white pine blister rust spread in California; causes

of decay in western hemlock; a graft-transmissible mosaic disease of American elm; control of pecan scab; spot fumigation proved effective against root knot; nematodes shown to spread insects and plant diseases in soil; hot-water and formalin treatment of narcissus bulbs found effective against bulb or stem nematode; black blighting and yellow stunting of the Pacific Northwest sugar-beet-seed crop found due to B and S deficiencies, respectively; a tobacco injury proved due to B deficiency, a black-root-rot resistant high quality Burley tobacco developed by selection, and downy mildew controlled by high temperatures; sugarcane chlorotic streak disease found spreading in Louisiana; and a summary of the work in identifying and collecting fungi and in the plant-disease survey.

Diseases of plants in the United States in 1939, N. W. NANCE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1941, Sup. 128, pp. 209-378, figs. 21*).—This twenty-third annual report on the incidence of plant diseases in the United States follows the usual plan (*E. S. R., 84, p. 59*) in presenting weather data before taking up the diseases of individual crop plants.

Recent developments in plant diseases in the United States, N. E. and R. B. STEVENS. (*Univ. Ill. et al.*). (*Bot. Rev., 7 (1941), No. 12, pp. 714-736, figs. 11*).—The present summary of information on certain diseases in the United States through the season of 1940 (29 references), largely a continuation of one previously noted (*E. S. R., 77, p. 793*), includes the Dutch elm disease, wasting disease of eelgrass, X-disease of peach, tobacco downy mildew, bacterial wilt of corn, bunt, *Cercospora* foot rot, stem rust, and leaf rust of wheat, bean rust, and late blight and bacterial ring rot of potato.

The Plant Disease Reporter, [January 15 and February 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 26 (1942), Nos. 1, pp. 1-31, figs. 2; 2, pp. 31-56; 3, pp. 57-82, figs. 2*).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 1 and 2, *Prunus*, and No. 3, *Pseudolarix* to *Pyrus*), the following items are noted:

No. 1.—The weather and plant disease situation in Massachusetts for 1941, by O. C. Boyd; fruit diseases in Idaho in 1941, by E. C. Blodgett; diseases of fruits and vegetables on the New York market during the months of January to August, inclusive, 1941, by C. O. Bratley and J. S. Wiant; grass disease in Wisconsin in 1941, by J. L. Allison and D. W. Chamberlain; and crown gall on the weed *Malva rotundifolia*, by E. M. Hildebrand and L. M. Massey.

No. 2.—The use of Spergon for sweetpotato seed and sprout treatments, by O. H. Elmer; observations on some diseases of tomatoes and other vegetables in south Texas, including a new tomato disease of unknown cause considered distinct from bunchy top and involving an internal necrosis, for which the name "rosette" is proposed, by A. L. Harrison and S. S. Ivanoff; occurrence of tomato leaf mold (*Cladosporium fulvum*) and of muskmelon powdery mildew (*Erysiphe cichoracearum*) in the field in New Hampshire, by R. W. Barratt; downy mildew (*Peronospora manshurica*) on soybean seeds, by H. W. Johnson and C. L. Lefebvre; charcoal rot (*Rhizoctonia bataticola*) of corn and sorghum in Nebraska, by J. E. Livingston; some observations on tobacco diseases in Virginia in 1941, by S. B. Fenne; and spread of white pine blister rust in southern Appalachian States in 1941, by R. G. Pierce.

No. 3.—Grass diseases in Michigan in 1941, with host and pathogen indexes, by J. R. Hardison; brief notes on *Phyllachora fusicarpa* in Florida, and destructive occurrence of *Diplodia natalensis* on okra stalks in Alabama; spread of white pine blister rust during 1941; and new blister rust infections for 1941.

[**Phytopathological studies by the Georgia Station**]. (Partly coop. U. S. D. A. et al.). (*Georgia Sta. Rpt. 1941, pp. 25-28, 102, 105-107, fig. 1*).—Brief reports are given on the reaction of cotton varieties to cotton wilt and root

knot; muscadine grape diseases, including a black rot differing from that of bunch grapes, and *Cercospora brachypus* (a *Mycosphaerella*) leaf disease by Jenkins (E. S. R., 86, p. 648); pepper resistance to *Sclerotium rolfsii*; peanut leaf spot control; control of tomato *Macrosporium* blight and stem canker; water-melon breeding for *Fusarium* wilt resistance; selection of snap beans (also bunch or runner type) for resistance to root rots, nematodes, ashy stem blight, and southern blight (*S. rolfsii*); and diseases of Austrian winter peas, English garden peas, vetches, and lupines, with special reference to breeding and selection for resistance.

Plant pathology, G. M. REED (*Brooklyn Bot. Gard. Rec.*, 30 (1941), No. 2, pp. 81-85).—Brief reports are included on research for 1940 on the inheritance of resistance of oats hybrids to loose and covered smuts and physiologic races (including the experimentally produced) of these smuts, and sorghum smut, including the effect of endosperm removal, presoaking of seeds, and water extracts of seeds on infection, smut in relation to sorghum hybrids, and comparison of infection results in greenhouse v. field.

Report of the plant pathologist, L. N. H. LARTER (*Jamaica Dept. Sci. and Agr., Ann. Rpt.*, 1941, pp. 13-14).—Brief notes are presented on diseases reported and investigated during the year beginning April 1940, with special emphasis on those of banana, coconut, pimento, mango, potato, peanut, and cassava.

New and interesting plant diseases, W. C. MOORE (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 2, pp. 206-210, pl. 1).—The following are presented: A leaf blotch of *Cypripedium* caused by *Penicillium thomii*, leaf spot of *Primula*, and leaf spot of *Helenium* (*Septoria helenii*).

Leaf spot diseases of lettuce and Antirrhinum, T. E. T. BOND (*Trop. Agr. [Ceylon]*, 97 (1941), No. 2, pp. 62-67, pls. 2).—An account is given of two leaf spots new to Ceylon, viz, one of lettuce associated with *Septoria lactucae* and one of *A. majus* associated with *Phyllosticta antirrhini*.

Frost killing and hardiness of plants: A critical review, J. LEVITT (*Minneapolis, Minn.: Burgess Pub. Co.*, [1941], pp. [1]+V+211).—"Winter injury" takes a tremendous toll of plant life in all but tropical climates. There are many more or less distinct factors responsible for the injury, but it is now believed evident that by far the most destructive is the actual freezing of the plant and that an understanding of the cause and prevention of frost injury would to all practical purposes solve the winter injury problem. In this monographic review (25 pages of references) only those factors are considered which appear (or at one time have appeared) capable of shedding some light on the causes of frost injury and the mechanisms adopted by plants to prevent it. The subject matter is considered under the three main topics of frost killing, frost hardiness, and current theories on the causes of injury and resistance.

On the physiological basis of inherited disease resistance, J. W. GOWEN. (Iowa State Col.). (*Genet. Soc. Amer. Rec.*, 10 (1941), p. 145).—An abstract.

New species of Tennessee fungi, J. DEARNESS (*Mycologia*, 33 (1941), No. 4, pp. 360-366).—New species are described as occurring on living leaves of various hosts, under the genera *Phyllosticta*, *Phlyctaena*, *Septoria*, *Leptothyrium*, *Leptostromella*, *Gloeosporium*, and *Cercospora*, and *Briosia azaleae* n. comb., *Dothi-orella mali fructus* n. var., and *Coryneum rhododendri fusoideum* n. var.

Micromicetos nuevos para la flora Argentina [Fungi new to the Argentine flora], J. C. LINDQUIST (*Darwiniana*, 5 (1941), pp. 240-247).—Twenty-one species are briefly considered, for the most part plant-parasitic forms.

A method for characterizing smut fungi exemplified by some British species, G. C. AINSWORTH (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 2, pp. 141-147).—"A method is described by which the principal characters of a smut

fungus can be summarized by a formula comprised of 12 numerals. The method is illustrated by formulae for the commoner British smuts."

Data on the cultural characteristics of a species of *Coprinus*, G. T. JOHNSON and A. C. JONES (*Mycologia*, 33 (1941), No. 4, pp. 424-433).—The fungus studied was closely related to or identical with *C. cubensis*.

Notes on *Coprinus micaceus* growing in an unusual habitat, S. M. PADY (*Mycologia*, 33 (1941), No. 4, pp. 411-414).—The fungus was found growing and fruiting on oak flooring, with associated rotting of the wood.

Descriptions of the South African Pythiaceae with records of their occurrence, V. A. WAGER (*Bothalia*, 4 (1941), No. 1, pp. 3-35, figs. 18).—*Pythium* (10 species) and *Phytophthora* (7 species) are included. An annotated host index and 30 references are appended.

Water moulds as a source of infection by pathogenic species of *Phytophthora*, E. M. BLACKWELL and G. M. WATERHOUSE (*Mycologia*, 33 (1941), No. 4, p. 449).—A note suggesting that "as parasitic species of *Phytophthora* can lead a saprophytic existence in the soil, so they may abide saprophytically in water."

On the history and diagnosis of *Polyporus tomentosus* Fries, *Polyporus circinatus* Fries, and *Polyporus dualis* Peck, W. R. HADDOW (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 2, pp. 179-190, pl. 1).

Las especies de *Septobasidium* en la Argentina, J. B. MARCHIONATTO (*Darwiniana*, 5 (1941), pp. 248-263, pls. 4, figs. 3; *Eng. abs.*, p. 263).—Ten species and one variety of this fungus genus are described.

Some lethal effects of ultra-violet radiation on fungus spores, A. DIMOND and B. M. DUGGAR. (Univ. Wis.). (*Natl. Acad. Sci. Proc.* 27 (1941), No. 10, pp. 459-468, figs. 3).—Testing spores of *Rhizopus suinus*, *Mucor dispersus*, and *Aspergillus melleus* with respect to their resistance to ultraviolet radiation of 2,650 a. u. wavelength, sigmoid survival curves were obtained for the first and for the minus strain of the second fungus from 4-day cultures, whereas curves describing a logarithmic order of death were exhibited by *A. melleus* spores from similar cultures. The three fungi showed marked differences in susceptibility to this irradiation, which may possibly be accounted for by a combination of the differences in pigmentation, spore size, and number of nuclei. A trend of increasing resistance to irradiation with increased age was observed for *R. suinus* spores.

Tenacity of protective fungicides, J. W. HEUBERGER. (Conn. [New Haven] Expt. Sta.). (*Chron. Bot.*, 7 (1942), No. 1, pp. 9-10).—The author discusses inherent, added, and reduced tenacity; methods of determining and evaluating tenacity of protective fungicides in the laboratory; tenacity of some copper compounds; comparison of laboratory and field data on tenacity; and tenacity of new materials.

Vergleichende Untersuchungen über den mikrobiciden Effekt verschiedener Konservierungsmittel [Comparative investigations of the bactericidal action of various preservative substances], H. LAGONI (*Zentbl. Bakt. [etc.]*, 2. Abt., 103 (1941), No. 12-14, pp. 225-231, fig. 1).—Assay of the growth-inhibitory effects under laboratory conditions indicated that diacetyl possesses almost as strong a bactericidal action as benzoic acid, whereas sodium benzoate does not.

Attenuation of bacteria pathogenic on plants, A. J. RIKER. (Univ. Wis.). (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 392-393).—A brief review of work by the author and others.

Microbial activity as influenced by root excretions, M. I. TIMONIN (*Chron. Bot.*, 6 (1941), No. 19-20, p. 440).—Continuing work previously noted (E. S. R., 85, p. 69), results so far obtained apparently indicate that the *Fusarium*-resistant

flax variety used excretes or diffuses HCN through its roots in sufficient amounts to influence various groups of micro-organisms differently.

Here's a microbe that needs no pampering, W. W. UMBREIT and K. G. VOGLER (*Wisconsin Sta. Bul.* 453 (1941), pp. 62-63).—This is a brief report of studies on metabolism of the sulfur bacterium *Thiobacillus thiooxidans* and the mechanism by which it acts on S to control common potato scab. The fact that it is the most acid-resistant of known micro-organisms also offers hope that it may prove useful to the fermentation industries.

X-ray and crystallographic studies of plant virus preparations.—I, Introduction and preparation of specimens. II, Modes of aggregation of the virus particles. III, The structure of particles; biological implications, J. D. BERNAL and I. FANKUCHEN (*Jour. Gen. Physiol.*, 25 (1941), No. 1, pp. 111-165, pls. 4, figs. 18).—These papers give an account of studies of plant virus substances isolated by F. C. Bawden and N. W. Pirie and examined by special X-ray apparatus and cameras developed for the purpose. Two modes of aggregation were observed, viz, a disoriented sol at low concentrations and an oriented sol passing continuously over to an oriented gel at higher concentrations. Solutions of medium strength divide into two layers on standing. X-ray examination indicated the particles to be equidistant and the sol to be a new kind of liquid crystal with a regular hexagonal arrangement in cross section. The aggregation phenomena are discussed in great detail. The original "crystals" observed by Stanley (*E. S. R.*, 73, p. 800; 77, p. 205) are shown to be gels of the type here studied in the form of elongated tactoids. In these gels the particle arrangement in cross section is so perfect that each specimen is a two-dimensional single crystal. It is concluded that the virus preparations consisted of approximately cylindrical particles about 150 a. u. in diameter. The forces maintaining the particles equidistant in these gels are probably due to the ionic atmospheres surrounding them. Further consideration of the results leads to an explanation for the other colloid phenomena shown by the viruses, particularly the formation of tactoids and gels. The spindle shape of the tactoids is shown to be due to anisotropic surface tension caused by the parallel arrangement of the long particles on the surface. Dilute gels appear to be composed of tactoids of a multiply branched character showing thixotropic behavior. This theory may have wide extensions to other colloid systems.

Even in solution the particles were found to have an inner regularity like that of a crystal, but closer analysis revealed that the X-ray patterns are not directly comparable to those of a crystal. Contrary to earlier observations, the particle seems to be virtually unchanged on drying and must therefore contain but little water. There are marked resemblances with the structure of both crystalline and fibrous protein, but the virus structure does not belong to any of the classes hitherto studied. Comparisons of the optical and X-ray examinations are discussed for viruses of three strains of tobacco mosaic, two of cucumber mosaic, two of potato X, and one of tomato bushy stunt. In the last case, measurement confirmed the deduction from its cubic crystal habit that it was composed of spherical rather than long particles. This single example is sufficient to show that the elongated particle form which gives rise to all the anomalous physical properties of the other viruses studied is of no essential biological importance. The similarity and differences observed between the physical properties of these preparations run closely parallel to their clinical and serological classification. The biological implications of the results of the study are discussed, together with possible applications of the new methods of examination to the study of colloid and biological problems.

Some notes on the relationship of plant viruses with vector and non-vector insects, K. M. SMITH (*Parasitology*, 33 (1941), No. 1, pp. 110-116, pls. 2).—“Extracts of caterpillars and other insects are shown to inhibit the infective power of tobacco mosaic and tobacco necrosis viruses. The inhibitor is not sedimented after spinning for 2.5 hr. at 30,000 r. p. m. Experiments with nonvector insects such as caterpillars have shown that the virus of sugar beet curly top, of tobacco ring spot, and other viruses are destroyed within the body of the insect. On the other hand, tobacco mosaic virus passes through the body of the caterpillar unchanged though greatly reduced in concentration. By the use of the specific insect vector and artificial feeding methods it was possible to recover the virus of curly top 24 hr. after it had been injected into the blood of the caterpillar, but the viruses of tobacco mosaic and tobacco necrosis could not be so recovered. Experimental evidence is given to show that the virus of beet curly top is present in the saliva of viruliferous insects.”

A virus disease of *Emilia scabra*, C. A. LOOS (*Trop. Agr. [Ceylon]*, 97 (1941), No. 1, pp. 18-21, pl. 1).—The principal symptom of this virus disease, first observed in 1940, is a yellow vein banding. It was successfully transmitted by grafting and differs from the spotted wilt on this weed host.

The cytoplasmic and nuclear inclusions associated with severe etch virus, F. M. L. SHEFFIELD (*Jour. Roy. Micros. Soc.*, 61 (1941), No. 1-2, pp. 30-45, pls. 3).—The author describes further properties than those noted by Kassanis (*E. S. R.*, 83, p. 205) of the two kinds of inclusions induced by this virus: (1) The cytoplasmic inclusions are amorphous, consisting chemically of mixtures of proteins with fats and lipids. They are formed by the aggregation of particles which appear in the streaming cytoplasm, and may contain some birefringent particles and give rise to small needlelike bodies. They can be pricked or divided into portions with a microneedle. They contain the virus, which is also present in other parts of the cell. They are numerous and occur in most tissues of the plant. (2) The intranuclear inclusions give protein reactions and are more stable. They take the form of thin rectangular plates, and as many as 30 may be found in a single nucleus. They can be isolated, but can be broken or dissolved only with difficulty. Almost every nucleus contains them and they have been found in almost all tissues. They occur in the seed but have not been found in the young embryo. The virus is not transmitted by the seed. These two types of inclusions are briefly discussed and compared with other inclusions occurring in diseased and normal tissues.

A blotch and char-spot of western grasses, R. SPRAGUE (*Oreg. Expt. Sta. coop. U. S. D. A. and N. Dak. Sta.*). (*Northwest Sci.*, 15 (1941), No. 4, pp. 81-85, fig. 1).—The tawny leaf blotch of some Pacific coast grasses and the charcoal or char spot of some western grasses (hosts and collections listed) are due to *Septogloeum oxysporum*, which produces stromata bearing pycnidia and perithecia. It is expected that the fungus will eventually be assigned to a *Dothidella*-like genus, and it is related to if not identical with the species known sometimes as *D. aristidae*.

Stagonospora arenaria on grasses, R. SPRAGUE (*Oreg. Expt. Sta. coop. U. S. D. A.*). (*Mycologia*, 33 (1941), No. 4, pp. 371-379, figs. 2).—*S. arenaria* causes a purple leaf blotch of a number of grasses in the north temperate and subarctic regions of the Northern Hemisphere. An emended description of the species is presented.

Turf injuries in Minnesota, I. W. TERVET (*Abs. in Minnesota Sta. Rpt. 1941, p. 46*).—“Snow mold of bent and other turf grasses was severe in the spring of 1941. Some of this injury was due to a fungus—*Typhula itoana*—that had not been recognized in Minnesota as associated with this disease. An unusual de-

velopment of fruiting bodies of this fungus occurred on one bentgrass area in November 1940 and severe snow mold occurred in April 1941 on the grass which had previously borne sporophores. A second type of injury resulting in the death of extensive areas of bent and bluegrass occurred in the 2 weeks following the disappearance of the snow. This injury apparently resulted from exposure of the waterlogged turf to sunlight and strong wind resulting in a scorching of the leaf blades and finally death to the plant."

Physiological studies of the fungus *Ophiobolus graminis* Sacc.—I, Growth factor requirements, N. H. WHITE (*Jour. Council Sci. and Indus. Res. [Austral.], 14 (1941), No. 2, pp. 137-146, figs. 2*).—"*O. graminis* requires the growth factors biotin and thiamin for mycelial development. Growth occurs only when biotin is present, but more than double the amount of growth follows the addition of thiamin. Either of the growth factors can be a limiting factor when present in suboptimal amounts. For optimal growth conditions, *O. graminis* requires about 0.1 mg. of solid biotin (2.0 vitamin H units) and 0.1 mg. of solid thiamin (30.0 vitamin B₁ units) per 100 ml. of solution. Growth factors are present in optimal amounts in extracts of wheat roots, wheat straw, and in 0.5 percent peptone. Soil extracts are deficient in both the growth factors, and 0.05 percent 'Marmite' solution contains a suboptimal amount of biotin. Growth of the fungus is limited by the interaction of three sets of factors—biotin, then thiamin, and then a nutritional factor present in wheat straw, wheat roots, peptone, and asparagine. The growth factor requirements of the fungus are discussed in relation to certain aspects of its parasitism."

Alkaloids from *Zephyranthes texana*, *Cooperia pedunculata*, and other Amaryllidaceae and their toxicity to *Phymatotrichum omnivorum*, G. A. GREATHOUSE and N. E. RIGLER. (Tex. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 28 (1941), No. 8, pp. 702-704).—Lycorine was shown to occur in the bulb and root tissues of *Z. texana* and *C. pedunculata* at about 0.02 and 0.04-0.05 percent of the fresh weight, respectively. A second alkaloid, presumed to be ψ -lycorine, was isolated from the mother liquors of *C. pedunculata* at about 0.002 percent concentration. Other members of the Amaryllidaceae were subjected to histochemical tests for alkaloids. Studies of the toxicity, quantity, and localization of the alkaloids in members of this plant family suggested that their presence may contribute to the immunity of this group to *P. omnivorum* root rot.

La desinfección de la semilla de algodónero y otros factores relacionados con su poder germinativo [The disinfection of cottonseeds and other factors in their germinability], M. A. DI FONZO (*Argentina Min. Agr., Junta Nac. Algodón [Pub.] No. 53 (1941), pp. 15*).

Ergot of *Paspalum* in Queensland, R. F. LANGDON (*Austral. Jour. Sci.*, 3 (1941), No. 6, pp. 169-170).—This is a note on the history of ergot of *Paspalum* spp. in Queensland and of the probable species of *Claviceps* concerned. Observations of 1940 suggested the existence of physiologic races of *C. paspali*, and the recent epidemic may have followed the production of a new and more virulent race.

Untersuchungen über die Genetik und Physiologie der Resistenz der Kartoffel gegen *Phytophthora infestans* de Bary [Studies of the genetics and physiology of the resistance of potatoes to *P. infestans*], H. LEHMANN (*Züchter*, 13 (1941), No. 2, pp. 33-34, fig. 1).—Resistance to late blight in the 72-chromosome *Solanum demissum* appeared to behave as a simple mendelian dominant. The mode of inheritance of resistance was the same for the two fungus races used.

La podredumbre anular o marchitez bacteriana de las papas [Bacterial ring rot of potatoes], D. A. TEXERA and A. S. MÜLLER (*Agr. Venez.*, 5 (1941),

No. 57-58, pp. 27-30, figs. 2).—A brief general account of the disease due to *Phytophthora sepedonica* in Venezuela.

Untersuchungen über die "Sang"-Krankheit der Kartoffeln im Rheingau [Investigations of the "sang" disease of potatoes in the Rheingau], G. GLÖCKNER (*Angew. Bot.*, 22 (1940), No. 3, pp. 201-252, figs. 13).—In the northern part of Rheingau there has appeared for several years a wilt disease known locally as "sang," which annually makes inroads varying from reduced yields to total loss of the crop. The disease is first observed when prolonged rains are followed suddenly by several days of hot, dry weather, there being a rolling of the upper leaves, followed by a yellowing of the whole plant, progressive rolling and wilting of the leaves from above downward, drooping of the leaf stalks and shoots, and final death of the plant starting from the leaf tips. Microscopical examination of the infected stems revealed the presence of *Verticillium albo-atrum*. The author discusses the relations of soil, climate, culture, and fertilization to the disease, varietal reactions, and control experiments and recommendations, and compares similar diseases in other regions. There are 38 references.

Versuche zur Schaffung einer einfachen Methode für die Prüfung des Verhaltens verschiedener Kartoffelsorten gegen Schorf [Attempts to develop a simple method of testing the reactions of different potato varieties to common scab], W. MICHEL (*Angew. Bot.*, 22 (1940), No. 2, pp. 133-146).—From the experiments outlined, the author believes he has shown a correlation of the amount of tuber transpiration by a potato variety with its reaction to *Actinomyces scabies* and that this relation offers a basis for developing a practical test for scab resistance. The preliminary results are presented because of lack of assurance that the studies could be continued.

Effect of sulfur and limestone soil treatments on potato scab in a sandy soil, A. H. EDDINS. (Fla. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 11, pp. 312-316).—In 4-yr. tests in Florida, scab was reduced in infested Leon fine sand (original pH 5.3-6.2), prairie phase, by S treatment, but the pH reactions established proved unsuitable for the best growth of potatoes. The disease was also reduced but not eliminated from the first crop grown in soil which had been treated with both S and limestone between potato crops. Neither treatment appeared very practical. In the latter case the disease increased the second year, being then almost as severe on potatoes grown in the treated as in the nontreated land.

Obtaining virus-free potatoes, J. G. BALD and D. O. NORRIS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 3, pp. 187-190).—"Two attempts have been made to obtain potatoes on the variety Up-to-Date (Factor) free from all virus diseases, particularly from virus X, which was reported to be present in every plant of this variety. In the first attempt one tuber free from virus X was obtained, but it was found to carry the virus of leaf roll. At the second attempt tubers were found which appeared to be completely virus-free."

Studies on the nature of rice blast resistance, I-III [trans. title], H. YOSHII (*Bul. Sci. Fakult. Terkult., Kyushu Imp. Univ., Fukuoka, Jap.*, 9 (1941), No. 3, pp. 277-291, 292-296, 297-307; *Jap. text; Eng. abs.*, pp. 291, 296, 307).—Three papers are presented:

I. *The effect of silicic acid to the resistance.*—The resistance of the leaf blade to rice blast (*Piricularia oryzae*) and the percentage of silica therein were proportional to the amount of silicic acid supplied in the nutrient solution, but the toughness of the blade was not.

II. *The effect of combined use of silicic acid and nitrogenous manure to the toughness of the leaf blade of rice and its resistance to rice blast.*—Adding

silicic acid to the soil increased the plant's resistance to blast. The toughness of the leaves decreased with increase in nitrogenous manure. With equal amounts of the latter, the percentage of silica in the leaves of rice grown in solutions containing silicic acid was higher but their toughness was less than in the absence of added silicic acid. Measurement of the toughness of the leaf blades is considered an effective method of grading rice for resistance to blast, when grown under unfavorable conditions such as surplus of nitrogenous manure.

III. *Relation between rice blast resistance and some physical and chemical properties of the different portions of the leaf blade of rice.*—Measuring the toughness and percentages of silica and N at the tip, middle, and basal portions of the leaf blade, the resistance to needle puncture was greatest towards the base, intermediate at the middle, and least at the tip; the percentage of silica was greater at the tip than at the base, whereas the reverse was true for N. It is concluded that the susceptibility of rice to blast is proportional to the amount of N but inversely so to that of silica in the different parts of the leaf blade, but there is little or no relation between resistance and the toughness of portions of the leaf.

Sterility of rice panicles, E. BALDACCII (*Internatl. Bul. Plant Protect. [Roma]*, 15 (1941), No. 6, pp. 114M-116M).—A note on this trouble in Italy and the various factors concerned directly or indirectly in its etiology.

La mancha blanca del ajonjolí [White spot of sesame], A. S. MÜLLE and D. A. TEXERA (*Agr. Venez.*, 5 (1941), No. 57-58, pp. 47-49, figs. 3).—On the disease of leaves and seed capsules due to *Cercospora sesami*.

Reducing southern Sclerotium rot of sugar beets with nitrogenous fertilizers, L. D. LEACH and A. E. DAVEY. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 1, pp. 1-18, figs. 4).—Nitrogenous fertilizers in field tests consistently reduced *S. rolfsii* infection in sugar beets, as did also $(\text{NH}_4)_2\text{SO}_4$, NH_3 , $\text{Ca}(\text{NO}_3)_2$, and cyanamide at equivalent amounts of N under favorable conditions. On the average, 50 lb. N per acre reduced infection by about 28 percent, 100 lb. by 54 percent, and 200 lb. by 65 percent. Yields were increased both by disease control and growth stimulation in most fields, but economical use of the method is confined to places where sugar beets respond to N fertilizers. In laboratory trials low concentrations of NH_3 in aqueous solution were toxic to both mycelia and sclerotia, and $(\text{NH}_4)_2\text{SO}_4$ was also mildly toxic to mycelia, but $\text{Ca}(\text{NO}_3)_2$ at similar concentrations proved nontoxic to mycelia and sclerotia. These data suggest that the field control may have been due to factors other than NH_4 toxicity. Heavy applications of anhydrous ammonia (NH_3) and cyanamide to spontaneously infested soils failed to destroy the sclerotia or to reduce their number. To explain the partial field control obtained, it is suggested that changes in the metabolism of the pathogen may reduce its growth or pathogenicity, that resistance of the host may be increased by alteration of its metabolism and anatomy, or that there may be a suppression of the pathogen because of a change in the balance of micro-organisms in the soil. There are 21 references.

Results of experiments with chlorotic streak in 1940, E. V. ABBOTT. (U. S. D. A.). (*Sugar Bul.*, 19 (1941), No. 14, pp. 60-61).—A progress report (E. S. R., 84, p. 207) considering the effect of this virus disease of sugarcane on germination and yields, secondary spread, varietal resistance tests, roguing as a means of control, and its present importance.

Two sweet potato soft rots and their prevention during storage (*New Jersey Stas. Plant Disease Notes*, 19 (1941), No. 7, pp. 25-28).—Notes are presented on *Rhizopus* soft rot, said to be one of the most destructive post-harvest diseases of sweetpotatoes. Attempts at control by lowering the storage temperature, however, are likely to lead to other rots, the most common of which

is due to *Mucor racemosus*. It is suggested from the data available that for best results sweetpotatoes be cured for 7-10 days at 80°-90° F. and relative humidity of about 92 percent, and then stored at 50°-55° and humidity of about 80 percent.

The determination of some amino acids in tobacco mosaic virus protein, A. F. ROSS (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 741-749).—The virus was found to contain 3.9 percent tyrosine, 4.5 tryptophane, 4.7 proline, 9 arginine, 6.7 phenylalanine, 6.4 serine, and about 5.3 percent threonine. Glycine and histidine appeared to be absent. No differences were noted between the chemically and centrifugally isolated samples.

A quantum yield for the inactivation of tobacco mosaic virus protein, F. M. UBER. (Univ. Mo.). (*Nature [London]*, 147 (1941), No. 3718, p. 148).—The yield value for the virus protein was found to be smaller and, compared to urease, inversely proportional to the molecular weight.

Versuche zur Markierung von Tabakmosaikvirus mit Radiophosphor [Study of radiophosphorus as a tobacco mosaic virus indicator], H. J. BORN, A. LANG, G. SCHRAMM, and K. G. ZIMMER (*Naturwissenschaften*, 29 (1941), No. 14-15, pp. 222-223).

Notas sobre la "yerba sosa" (Orobanche) del tabaco [Notes on *O. ramosa* parasitizing tobacco], S. C. BRUNER (*Rev. Agr. Cuba*, 23 (1940-41), No. 16, pp. 16-20, figs. 2).

Das Tabak-Ringspot-Virus als Erreger einer Gelbfleckigkeit des Kartoffellaubes [Tobacco ring spot virus as the cause of a yellow mottling of potato leaves], E. KÖHLER (*Angew. Bot.*, 22 (1940), No. 6, pp. 385-399, figs. 15).—From yellow mottled potato plants three strains of tobacco ring spot virus were isolated and identified on the bases of cross inoculations, serological reactions, and determination of inactivation temperatures and dilution limits.

A phytopathogenic bacterium fatal to laboratory animals, R. P. ELROD and A. C. BRAUN (*Science*, 94 (1941), No. 2448, pp. 520-521).—In a serological study of the green fluorescent phytopathogenic bacteria, *Phytomonas polycolor* (cause of a tobacco leaf spot) was found to be extremely virulent to small laboratory animals. Though a comparative study has not yet been completed, all available evidence suggests that it is in reality *Pseudomonas aeruginosa*.

The wheat rust problem of India, K. C. MEHTA (*Cur. Sci [India]*, 10 (1941), No. 8, pp. 357-361).—Sources of annual recurrence, dissemination in relation to initial outbreaks, physiologic races, and control methods in India are considered.

Diseases of vegetables, L. OGLVIE ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul.* 123 (1941), pp. IV+84, pls. 4).—This handbook takes up in succession the diseases of some 23 individual vegetable crops and their control and the various types of general control measures (soil and seed treatments, control of damping-off, fungicides, apparatus, and cleansing greenhouses). Indexes of parasites and of nonparasitic and virus diseases are provided.

Market diseases of fruits and vegetables: Asparagus, onions, beans, peas, carrots, celery, and related vegetables, G. B. RAMSEY and J. S. WIANZ (*U. S. Dept. Agr., Misc. Pub.* 440 (1941), pp. 70, pls. 16).—This is the seventh (E. S. R., 82, p. 59) in a series designed to aid in recognizing and identifying economically important pathological conditions of fruits and vegetables in marketing channels, to facilitate inspection and decrease losses. Of the 16 plates, 8 are in color.

Über die Abhängigkeit der Spritzmittelschäden von Temperatur und Jahreslauf [The dependence of spray injury on temperature and season of the year], H. DAXER (*Anz. Schädlingsk.*, 17 (1941), No. 3, pp. 26-35, figs. 6).—Beans were used as test plants. There are 18 references.

Chocolate spot of beans in 1941, W. M. WARE and H. H. GLASSCOCK (*Agriculture, Jour. Min. Agr. [Gt. Brit.]*, 48 (1941), No. 2, pp. 91-94).—Notes on this *Botrytis*-induced disease of field beans and broadbeans, with special reference to the 1941 epidemic in Great Britain.

Spraying and dusting for the control of celery early blight in the Everglades, G. R. TOWNSEND (*Florida Sta. Bul.* 366 (1942), pp. 26).—Reporting on 11 yr. of experimentation, this period has been marked by a transition from a 5-5-50 bordeaux formula prepared from difficultly soluble granular CuSO_4 and stone lime to 4-2-50 and 4-4-50 formulas prepared from readily soluble powdered CuSO_4 and $\text{Ca}(\text{OH})_2$. More recently many insoluble Cu compounds have been introduced as bordeaux substitutes. The experiments indicate that better results follow reduction of the Cu:Ca ratio to 2:1. Addition of wettable S to bordeaux reduced the injury by high-Ca bordeaux formulas and improved the control of early blight (*Cercospora apii*). Several plant nutrient materials added to the bordeaux did not seriously interfere with its fungicidal action. Most of the insoluble Cu compounds proved inferior to the bordeaux formulas, and the cuprous oxides and basic copper chloride are the only ones here approved for current use.

Investigations on the invasion of mushroom beds by *Pseudobalsamia microspora*, H. H. GLASSCOCK and W. M. WARE (*Ann. Appl. Biol.*, 28 (1941), No. 2, pp. 85-90, fig. 1).—It is concluded from the evidence that the fungus is introduced into the beds with the casing soil, and isolation from freshly dug soils further supports this view and indicates that it is a common soil organism. Methods of detecting and culturing the fungus are given. The most practical way of preventing introduction is to avoid contaminated soil, but in some instances early attacks were controlled by removal of the affected part of the bed and treatment of the site with disinfectants. Factors influencing reinfestation are discussed.

Effect of seed treatment on the stand and yield of peas, G. L. McNEW. (N. Y. State Expt. Sta.). (*Canner*, 92 (1941), Nos. 6, pp. 56, 58, 60, 62, figs. 2; 7, pp. 16, 18, 20).—This paper, summarizing the results of 15 field experiments with 7 varieties of peas, is not considered as the final word on the use of seed treatments but rather as a progress report. However, the results suggested to the author the following main conclusions: Cuprocide-graphite treatment is very effective and the least expensive of any tested, but may cause slight injury to the plants. The organic mercurials are good seed protectants and would probably be of most service where copper causes injury. New Improved Ceresan is not advised for peas because of injury. Sperguson offers such distinct promise for pea seed treatment that, in spite of its present price, canners are advised to test it further in experimental plantings.

Pepper wilt and control measures in the Province of Mendoza [Argentina], J. B. MARCHIONATTO (*Internat. Bul. Plant Protect. [Roma]*, 15 (1941), No. 5, pp. 90M-91M).—*Fusarium vasinfectum* was determined as the cause. When the plants were grown in very broad furrows, the factors favoring development of the disease were reduced to a minimum and considerably fewer plants were attacked.

Black root disease of white radish (*New Jersey Stas. Plant Disease Notes*, 19 (1941), No. 4, pp. 13-16).—A number of growers in northern New Jersey have encountered this disease, due to *Aphanomyces raphani*, in recent years, but satisfactory field control measures are still not available. The White Icicle variety has been most susceptible, the Red Globe types have not been seriously injured, and the White Chinese winter radish is reported very resistant. In pot tests chloropicrin gave perfect control, but it remains to be seen whether it can be used successfully under field conditions.

New developments in the control of tomato diseases, A. L. HARRISON. (Tex. Expt. Sta.). (*Contact*, 7 (1941), No. 3, pp. [2-3]).—A note on breeding for disease resistance, development of a wilt-resistant tomato, and spraying and dusting for leaf diseases.

Control of the kromnek (spotted wilt) disease of tomatoes, E. S. MOORE (*Nature* [London], 147 (1941), No. 3729, pp. 480-491).—A note on this virus disease in the Union of South Africa, with promising results through controlling the vector *Frankliniella schultzei*.

Fusarium wilt of watermelons.—I, Effect of soil temperature on the wilt disease and the growth of watermelon seedlings, M. N. WALKER (*Florida Sta. Bul.* 363 (1941), pp. 29, figs. 8).—From the studies reported it is concluded that 27° C. is the optimum temperature for infection and injury of seedlings of the Tom Watson and Kleckley Sweet varieties by *F. bulbigenum niveum*. The optimum for early infection is not particularly important, since with heavy soil infestation killing is practically the same at 20°-30° under exposure for as long as 30 days. Infection declined rapidly above 30° and practically ceased at 33°. The minimum temperature for infection was not determined. In the field other soil organisms may be complicating factors. Certain citrons were resistant to infection and wilt development, but their resistance appeared to be relative and infection and disease progress seemed merely to be slower than in watermelons. Tests of crosses of resistant citron with susceptible watermelons indicated the resistance to be recessive. Germination and early growth of watermelons and citrons were optimum at 31°-33°. Soil temperature effects were most marked during early growth stages, but later on air temperatures or other factors appeared more important at 24°-35°. There was some evidence that citron seedlings are somewhat more vigorous than those of watermelon and are also somewhat more tolerant of temperatures above 35°. Growth of the fungus appeared greatest at 27°, while the minimum was apparently slightly below 7.5° and the maximum about 38°.

The grey mould of fruit and some of its host plants, H. WORMALD (*Gard. Chron.*, 3. ser., 109 (1941), No. 2823, p. 44, fig. 1).—An eye rot of apples is associated with *Botrytis cinerea* on the calyx lobes. The occurrence of *Botrytis* is also reported on the dandelion, black-bryony, bramble, and sweet chestnut. Strains isolated from these hosts were shown capable of infecting apples.

Leaf variegation of the apple, C. E. COLE (*Jour. Dept. Agr. Victoria*, 39 (1941), No. 3, pp. 141-142, figs. 3).—From studies of this leaf variegation, said to be very common in Victorian orchards, it appears to be a virus disease of little economic importance transmitted by budding and grafting operations.

Control of apple blotch with "eradicant" fungicides, C. D. SHERBAKOFF and R. A. HYE (*Tennessee Sta. Cir.* 77 (1941), pp. [3], fig. 1).—It is concluded from the tests reported that where summer sprays are used the eradicant spray cannot profitably be employed except when directed against insects or some disease other than blotch. Where Cu injury follows the early cover sprays, an eradicant spray should allow use of a "safer" fungicide—e. g., wettable S—in these sprays. E'getol alone proved less effective for blotch than Keltt's eradicant spray (E. S. R., 85, p. 75) or the summer sprays.

Untersuchungen über den Apfelmehltau (*Podosphaera leucotricha* [Ell. u. Ev.] Salm) [Investigations of powdery mildew of apple], K. STOLL (*Forschungsdienst*, 11 (1941), No. 1, pp. 59-70, figs. 5).—An address reviewing the subject (8 references).

Methyl bromide and brown rot of stone fruits, L. L. CLAYPOOL and W. B. HEWITT. (Univ. Calif.). (*Blue Anchor*, 18 (1941), No. 2, pp. 25, 38).—From the tests reported it appears that methyl bromide may prove of some value as a

fungicide but that in concentrations and exposure times safe for fruit it has no value.

Mathematical model of embryo abortion in Phillips Cling peaches, G. A. BAKER. (Calif. Expt. Sta.) (*Jour. Agr. Res. [U. S.]*, 64 (1942) No. 3, pp. 173-178).—Though it is practically impossible to observe the time of abortion of peach embryos, the frequency distributions of the lengths of normal embryos at intervals throughout the growing season and the frequency distribution of the lengths of aborted embryos at harvest time can be observed. It is assumed that at any one time the lengths of normal embryos are distributed according to a Pearson type III curve and that abortion does not cause a change in their measured lengths. On these bases and on observable data it was found possible to compute any desired number of moments of $p(t)$, the function which represents the probability of abortion at time, t . As a control, the close connection of embryo abortion with gumming is noted, $p(t)$ being usually one-humped and paralleling the probability of gumming. Abortion occurs about 11 days before gumming. It is noted that $p(t)$ may be two-humped, and this has a marked effect on the distribution of the lengths of aborted embryos observed at harvest time. It is not known whether the second hump in $p(t)$ is associated with a corresponding increase in the probability of gumming. The observed facts appear to indicate the efficacy of the proposed model.

Virus diseases of the peach (*New Jersey Stas. Plant Disease Notes*, 19 (1941), Nos. 8, pp. 29-32; 9, pp. 33-36).—Symptoms and control are described, without references.

Cherry yellows less severe in New York, L. R. TEHON (*Amer. Nurseryman*, 74 (1941), No. 7, p. 24).—This virus disease is reported to be less severe in New York than in Wisconsin. Observations tend to indicate that at present it is transported into new areas by nursery stock.

Diseases of strawberries, J. B. DEMAREE (*U. S. Dept. Agr., Farmers' Bul.* 1891 (1941), pp. II+27, figs. 11).—This supersedes Farmers' Bulletin 1458 (E. S. R., 54, p. 149).

Raspberry spur blight (*New Jersey Stas. Plant Disease Notes*, 19 (1941), Nos. 5, pp. 17-20; 6, pp. 21-24).—The disease due to *Mycosphaerella rubina* is briefly described, and experiments and observations are presented leading to recommended culture practices which should tend to reduce losses from this infection. These include use of disease-free stock, avoidance of low, damp areas and excessive nitrogenous fertilization, keeping weeds down to permit free air circulation, and removal of dead canes.

Forschungsaufgaben des weinbaulichen Pflanzenschutzes [Research problems in plant protection as relating to grape culture], F. STELLWAAG (*Forschungsdienst*, 11 (1941), No. 2, pp. 153-160).—An address discussing the control of diseases and pests of grapes.

Recherches sur les causes de la résistance au mildiou des vignes américaines et de leurs hybrides [Studies on the causes of resistance of American grapes and their hybrids to mildew], I, II, L. RIVES and F. NYSTERAKIS (*Prog. Agr. et Vitic. (Éd. Est-Centre)*, 62 (1941), Nos. 10, pp. 168-170; 12-13, pp. 209-211).—Two papers are presented.

I. *Influence de la concentration du suc cellulaire: Mesures réfractométriques [Influence of the concentration of the cell sap: Refractometric measurements]*.—It is concluded from the data presented that there is no close relationship between the concentration of the cell sap and resistance to mildew.

II. *Influence de l'acidité: Mesures de pH [Influence of acidity: pH measurements]*.—The authors found no consistent correlation between the pH of the cell sap and resistance to mildew.

Mildew de la vid [Downy Mildew of the grape], C. A. DANÍES L. and F. PEÑARANDA CANAL (*Rev. Facult. Nac. Agron. [Colombia], 4 (1941), No. 10, pp. 1009-1036, pl. 1, figs. 5*).—A general account on the disease and its control and on the fungus (*Plasmopara viticola*) causing it.

Pierce's disease of grapevines, W. B. HEWITT. (Univ. Calif.). (*Blue Anchor, 18 (1941), No. 3, pp. 16-21, 36, figs. 7*).—A general account on this grape disease which is reported to be again killing vines in many California vineyards.

Black measles and little leaf may be confused with Pierce's disease of grapevines, W. B. HEWITT. (Univ. Calif.). (*Blue Anchor, 18 (1941), No. 3, pp. 26-28, 40, figs. 4*).—The two diseases are described and differentiated from Pierce's vine disease.

Podridão do pé dos citrus [Citrus foot rot], J. DE ALENCAE (*Ceres [Minas Geraes], 2 (1941), No. 12, pp. 488-496, figs. 3*).—A general account of the *Phytophthora*-induced disease and its control in Brazil.

The effects of phosphorus deficiency on citrus, H. D. CHAPMAN and S. M. BROWN (*Hilgardia [California Sta.], 14 (1941), No. 4, pp. 161-181, pls. 2, figs. 2*).—In connection with a fertilizer test on a calcareous Hanford fine sandy loam with young navel-orange trees in 55-gal. containers, an acute P deficiency of sudden onset developed in those receiving N or N plus K but no P. An abnormal shedding of leaves just after the spring bloom and 3 yr. after planting was the first indication of malnutrition, and other symptoms developing are described in detail and illustrated in color. The inorganic and total P in all parts of the tree were found to be subnormal, that in the bark and woody tissues being especially low. Fruit maturing on the P-deficient trees just prior to development of the leaf symptoms was a deeper orange color, with thicker rind and less juice than on the P-treated trees. A secondary Mn deficiency developed in the P-deficient trees, believed due to a decreased solvent power of the roots for the sparingly soluble Mn compounds of this soil, occasioned by diminished root respiration. A survey of commercial groves on similar soils showed no symptoms of P deficiency. That occurring in the experimental cultures is thought to have resulted in part from the restricted root development in the limited amount of soil available for root expansion. There are 18 references.

The effects of sulfur deficiency on citrus, H. D. CHAPMAN and S. M. BROWN (*Hilgardia [California Sta.], 14 (1941), No. 4, pp. 183-201, pls. 2, figs. 2*).—A malnutrition condition developing in young navel-orange trees growing in a granite-derived soil in 55-gal. containers proved to be S deficiency, characterized by abnormal yellowing of the new-cycle growth and resembling the more or less uniform yellowing from N deficiency. In contrast to the latter, S-deficient leaves had a higher N content and a lower S content than normal, leaf analysis thus differentiating between the two troubles. Immature fruit on S-deficient trees were light yellowish green, and maturing fruit failed to develop the characteristic orange color. In the less severely affected fruit the contents of many of the juice vesicles were gelatinized, as in granulation. Other symptoms are detailed, including the results of chemical analysis. A certain degree of parallelism in composition was found between the S- and P-deficient trees. Though many western soils are low in total S, it is not believed that, except for isolated cases, commercial citrus orchards would benefit by sulfate fertilization, sufficient S to meet the requirements usually coming from other sources.

Observations on the parasitism of Rosellinia pepo Pat., J. M. WATERSTON (*Trop. Agr. [Trinidad], 18 (1941), No. 9, pp. 174-184, pls. 4, figs. 2*).—Among the highly susceptible host plants noted are avocado, *Artocarpus* spp., *Erythrina* spp., *Inga laurina*, nutmeg, lime, coffee, and cacao, the last being the chief economically important host. In attempting to gage the factors in both

field and laboratory which control the physiology of parasitism in this fungus, analyses of soils within and adjacent to *Roseellinia* patches showed no relations of pH and of amounts of N, organic matter, or of available potash and phosphate with the incidence of infection. The disease was most frequently observed in Trinidad persisting in soils of light texture, and this point is stressed as of some significance in relation to studies of the water relationships of the soil. It was experimentally established that the rate of infection in cacao seedlings was most rapid in the drier and better aerated series, but it was not determined whether soil moisture could be reduced to the level where host and parasite might exist together without a parasitic relationship. There are 34 references.

Recent investigations of interest to florists (*New Jersey Stas. Nursery Disease Notes*, 14 (1941), No. 6, pp. 21-23).—Brief notes are presented on *Fusarium* wilt of sweet-william (*Dianthus barbatus*), *Sphaceloma* scab of poinsettia, and Ca deficiency as a factor in abnormal rooting of Philodendron cuttings.

A wilt disease of godetias and other ornamental plants, R. E. TAYLOR (*Ann. Appl. Biol.*, 28 (1941), No. 2, pp. 91-101, pl. 1).—"A wilt disease of godetia, clarkia, antirrhinum, and sweet-sultan (*Centaurea moschata*) caused by one or more species of pycnidial fungi is described. The fungi isolated from the various hosts have generally proved to be pathogenic to all of them when cross-inoculated. Other herbaceous ornamental plants are susceptible under experimental conditions. The various isolates are considered to be different strains of a single species which is provisionally identified as *Diptodina passerinii* Allesch., previously recorded as a parasite of antirrhinum. The fungus is a wound parasite and gains entrance to the host through the stem, frequently just above the soil and at the leaf-axils. There is no evidence of infection via the roots. The cultural characters of the isolates are compared."

Chrysanthemums resistant to Verticillium wilt, P. E. TILFORD. (Ohio Expt. Sta.). (*Chrysanthemum Soc. Amer. Bul.*, 9 (1941), No. 3, pp. 2-3).—As a result of 4-yr. tests of 423 chrysanthemum varieties, those found resistant are listed under eight groups on the basis of types of varieties.

Botrytis crown rot of irises, L. DOBDALE. (Minn. Expt. Sta.). (*Minn. Hort.*, 69 (1941), No. 7, pp. 123-131, figs. 2).—A note on this iris disease and its successful control by treating the rhizomes with mercurials when they are transplanted and setting them in new soil.

The spread of eelworm in commercial narcissus plantings, A. BEAUMONT and L. N. STANILAND (*Ann. Appl. Biol.*, 28 (1941), No. 2, pp. 135-141, pl. 1, fig. 1).—*Anguillulina dipsaci* is introduced into commercial plantings by infested stock bulbs not given (or insufficiently) the hot-water treatment. Spread is chiefly by surface water and mostly in the direction of drainage. Tools, boots, and especially infested dried leaves in the cultivation operations are also means of spread. Narcissus leaves can become infected from January to May, and late infections are easily overlooked. In dry weather small numbers may persist from season to season. In commercial plantings, affected patches should be dug out completely and surrounded by a trench to prevent spread. Infested fields cannot safely be replanted for at least 3 yr. after the bulbs have been lifted. Field inspections are of value to the grower, but do not guarantee freedom from infestation.

The use of fungicides on orchids, A. G. KEVORKIAN and C. L. HOEN. (P. R. Expt. Sta.). (*Amer. Orchid Soc. Bul.*, 9 (1941), No. 12, pp. 328-330, fig. 1).—Fungus diseases of at least three genera of orchids are said to cause much injury to the plants, and particularly to those that have recently been brought from the wilds for cultivation in the Tropics and Subtropics. Several fungicides, especially bordeaux mixture (4-4-50), have prevented disease spread in well-renovated plants without injury in the many treated genera.

Root rot of *Ranunculus asiaticus* caused by *Pythium debaryanum*, C. M. TOMPKINS and J. T. MIDDLETON. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 3, pp. 179-183, figs. 2).—The authors describe a destructive root disease of Persian buttercup (*R. asiaticus*) prevalent in commercial plantings in four coastal counties of California. Its development and spread are favored by excessive moisture, poor drainage, cool weather, and crowding. The chief symptoms are a general wilting followed by rapid collapse and death, and the roots, tubers, stems, and petioles may be affected. *P. debaryanum* has been consistently isolated and has proved pathogenic in greenhouse tests, and its morphology and temperature relations are discussed. The incubation period for the disease was 11-25 days. In greenhouse tests the fungus proved pathogenic to young plants of Iceland poppy, columbine, fibrous-rooted begonia, butterflyflower, and cucumber. Persian buttercup seedlings were also experimentally infected by *P. ultimum* and *P. irregulare*, with symptoms similar to those induced by *P. debaryanum*.

Tests with new and old rose soil show value of sterilization, F. F. WEINARD. (Univ. Ill.). (*Florists' Rev.*, 88 (1941), No. 2263, pp. 11-12).—Tests indicated sterilized old soil (steam and hot water used) to be about as good as new soil.

Control black mold of rose grafts by chemical treatments, D. B. CREAGER (*Florists' Rev.*, 89 (1941), No. 2290, pp. 21-22, figs. 2).—In the experiment reported, by the Illinois Natural History Survey, all four chemicals tested reduced infection by *Chalaropsis thielavioides* and increased the number of plants grafting successfully. The best control was obtained with calcium hypochlorite, but with fewer plants successfully grafting than with the other materials. Semesan delayed graft union and scion development but gave good mold control. Potassium permanganate gave the poorest control, but its apparently stimulative effect resulted in the largest number of successful grafts. Good mold control was obtained with formaldehyde, and the number of successful grafts was only slightly less than with the preceding. A rapid method of testing the effectiveness of disinfectants is described.

Bulb rot of *Scilla nutans* [nonscripta] caused by *Penicillium cyclopium* Westling, B. SINGH (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 2, pp. 194-199).—This fungus was isolated from rotted bulbs of common blue squill and its pathogenicity proved. The symptoms of infection and the fungus itself are described. Fungicidal tests gave inconclusive results, but the disease was found to be worse in wet soils and when the bulbs were stored under high humidity and temperature.

Spread of snapdragon rust in Europe, E. LEPIK (*Internat. Bul. Plant Protect. [Roma]*, 15 (1941), No. 5, p. 93M, fig. 1).—The present distribution of *Puccinia antirrhini* in Europe is outlined and mapped.

Root rot of young, grafted dogwood (*New Jersey Stas. Nursery Disease Notes*, 14 (1941), No. 5, pp. 17-20).—This is a preliminary report of studies of a root rot of pink dogwood associated with *Pythium* sp., including control.

Your shade trees: Summer shade tree problems, P. P. PIBONE (*Amer. Forests*, 47 (1941), No. 6, pp. 296-297, figs. 3).—Notes on diseases and other disturbances of shade trees, including oaks, planes, elms, lindens, and chestnuts.

Reducing losses from tree diseases in eastern forests and farm woodlands, G. H. HEPTING (*U. S. Dept. Agr., Farmers' Bul. 1887* (1942), pp. [2]+22, figs. 9).—"A ready reference on diseases for both the forester and the farmer in the East."

Halalophragmium ponderosum Syd. on *Acacia leucophlaea* Willd., M. J. THIRUMALACHAR (*Jour. Indian Bot. Soc.*, 20 (1941), No. 5-6, pp. 293-298, pl. 1, figs. 4).—A study of this rust fungus, with comparison of the tumors induced to crown gall.

Chestnut breeding work in 1940, A. H. GRAVES (*Brooklyn Bot. Gard. Rec.*, 30 (1941), No. 2, pp. 87-93).—Progress is reported on the problem of developing a chestnut tree suitable for timber and at the same time resistant to chestnut blight.

Iron chlorosis in tree windbreaks, H. E. WAHLBERG (*Calif. Citrog.*, 26 (1941), No. 8, p. 228).—Occurrence noted in eucalyptus trees in southern California.

Preliminary investigation of oak diseases in Illinois, J. C. CARTER (*Ill. Nat. Hist. Survey Bul.*, 21 (1941), Art. 6, pp. 191-230, figs. 52).—In studies of 11 species of oaks in Illinois it was found that cankers, dieback, twig blight, and root rot are important in the decline and death of trees both in nursery, shade, and ornamental plantings and in native stands. Numerous fungi, 22 of which are here described, were associated with cankers, deep wood infections, dieback, and twig blight. Those associated most consistently with canker and dieback were species of *Dothiorella*, *Coryneum*, *Cytospora*, *Nummularia*, *Diatrype*, and *Phomopsis*. Those principally associated with cankers were species of *Phoma*, *Fusicoccum*, *Sphaeropsis*, and *Bulgaria*, and with dieback species of *Coniothyrium* and *Pyrenochaeta*. These fungi can develop on dead wood, but many of them are potential parasites of oak trees, especially when the latter are growing under adverse conditions. Successful inoculations on oak species were made with *Dothiorella quercina* and *Coryneum kunzei*.

A needle blight of Austrian pine, R. L. HULBARY (*Ill. Nat. Hist. Survey Bul.*, 21 (1941), Art. 7, pp. [2]+231-236, figs. 4).—In blighted needles of *Pinus nigra austriaca* collected in northern Illinois in the fall of 1938, immature stromata indicated the cause of the disease. They remained quiescent out-of-doors through the winter but by March 1 had emerged as strongly erumpent, loaf-shaped structures, and 1.5 mo. later pycnidial locules were becoming differentiated and by May 15 conidia were being produced. The fungus is described as *Dothistroma pini* n. gen. and sp. in the scolecosporous division of the Phomaceae.

Results of the survey of the little-leaf disease of southern pines in Alabama (a preliminary report), W. R. BOGGESE, P. A. SWARTHOUT, and E. R. TOOLE (*Alabama Sta.*, 1941, pp. [2]+15, figs. 2).

Blister rust in 1940, L. R. TEHON (*Amer. Nurseryman*, 73 (1941), No. 8, pp. 26-27).—This note summarizes the extension of infected areas in the United States (E. S. R., 83, p. 360).

Treatment of white pines infected with blister rust, J. F. MARTIN and G. F. GRAVATT (*U. S. Dept. Agr., Farmers' Bul.* 1885 (1942), pp. II+28, figs. 14).—This replaces Department Circular 177 (E. S. R., 45, p. 753).

Canker-stain disease of planetrees, P. V. MOOK. (U. S. D. A.). (*Trees Mag.*, 4 (1941), No. 3, pp. 7, 15, 16, 18, figs. 4).—This is a general account of the present status of the disease due to *Endoconidiophora* known to affect American and London planetrees (*Platanus occidentalis* and *P. acerifolia*, respectively), including the known distribution in the eastern United States, the symptoms, mode of dissemination, and means of prevention and control.

Species of Stigmina and Stigmella occurring on Platanus, D. J. and C. O. SMITH (*Hilgardia [California Sta.]*, 14 (1941), No. 4, pp. 203-231, figs. 10).—On the basis of morphological and physiological differences and of host specificity, it is indicated that three distinct species of fungi are involved in leaf spots on planetrees, viz, *Stigmina platani* on *P. orientalis* alone, *Stigmella platani-racemosae* on *P. racemosa*, and also proved capable of infecting *P. wrightii*, and the fungus here named *Mycosphaerella polymorpha* n. comb. (= *M. stigmina-platani*) on *P. occidentalis* and proved pathogenic also for *P. racemosa*, *P. wrightii*, and *P. acerifolia* but not for *P. orientalis*. The last fungus produced

conidia ranging from typical *Stigmina* to *Cercospora* types and hitherto unnamed because erroneously identified with *S. plantani*. The *Mycosphaerella* stage, it is believed, may be identical with *M. platanifolia*, and *S. visianica* appears to be identical with the conidial stage. Each of these species has been isolated and grown in pure cultures, and is discussed in detail. There are 25 references.

Zonnebrand bij Hevea [Sunscald of Hevea], R. VAN DER VEEN (*Bergcultures*, 15 (1941), No. 11, pp. 314-317, fig. 1).—On the disease of Para rubber trees due to infection by *Diplodia* (*Botryodiplodia theobromae*).

Over de bestrijding van eenige ziekten, die houtwonden aan het onderste deel van den stam van hevea veroorzaken [Control of some diseases causing wounds on the lower part of the trunk of the Para rubber trees], W. H. DE JONG (*Bergcultures*, 15 (1941), No. 33, pp. 1134-1137).

New methods for the cultivation of wood-rotting fungi, E. C. BADCOCK (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 2, pp. 200-205, pl. 2).—A new medium is described, consisting of sawdust of a readily decayed species of wood such as beech or spruce, well mixed with 5 percent by weight of an accelerator, the principal ingredients of which are corn meal and bonemeal. On this medium exceptionally good growth of a wide range of species was obtained. The method is suggested for resistance tests of treated wood samples. Adding the accelerator to garden soil or to cotton wool also made a medium on which vigorous growth developed.

Chemical treatment of wet mechanical pulp in order to control damages caused by fungi, E. RENNERFELT (*Svenska Skogsvårdsför.*, *Tidskr.*, 39 (1941), No. 1, pp. 19-94, figs. 17; *Swed. abs.*, pp. 89-92).—Following a review of previous attempts at avoiding fungus injuries to pulpwood, the author describes laboratory tests with different fungicides on artificial substrata and on wet mechanical pulp and chemical treatment tests of pulp at the mills, and the effects of the chemicals on the composition and growth of the fungus flora. Good results are reported at several mills with ethyl mercury chloride, and factory-scale experiments with this fungicide also proved favorable.

A manual of agricultural helminthology, I. N. FLIPJEV and J. H. SCHUURMANS STEKHOVEN, JR. (*Leiden [Netherlands]: E. J. Brill, 1941, pp. XV+878, figs. 460*).—The five parts of the book concern general morphology and biology of nematodes, systematics, technical methods for collection and preparation, plant-parasitic nematodes, and insect parasites. A supplement considers the closely related Gordiacea or Nematomorpha. Over six pages of literature references to insect parasites are included.

Verbreitung und Schadwirkung des Stockälchens (*Anguillulina dipsaci*) in Schleswig-Holstein [The distribution of and damage by the stem nematode in Schleswig-Holstein], H. GOFFART (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 51 (1941), No. 2, pp. 97-102, figs. 2).—Data on the relative damage by months and on the numbers of nematodes according to soil depth are included, and the relative susceptibilities of 25 species of plants in 10 families are tabulated.

ECONOMIC ZOOLOGY—ENTOMOLOGY

American wild life, illustrated (*New York: Wise & Co., [1940], pp. [2]+XIV+749, pls. 6, [figs. 326]*).—This is a compilation that was prepared by the Writers' Program of the Work Projects Administration in the city of New York.

[Work in game management by the Wisconsin Station] (*Wisconsin Sta. Bul.* 453 (1941), pp. 58-60, fig. 1).—Studies briefly reported (E. S. R., 83, p. 82) by A. Leopold and A. Hawkins relate to the Riley Game Cooperative in

western Dane County and the history of the Faville Grove area in Jefferson County.

The "gopher" (*Citellus richardsonii* (Sabine)) as an experimental host for *Trichinella spiralis*, E. P. OFFUTT, JR., and O. R. MCCOY (*Jour. Parasitol.*, 27 (1941), No. 6, pp. 535-538).—It has been found that *C. richardsonii* is very susceptible to infection with *T. spiralis*, 10 of 14 animals fed doses as small as from two to five larvae per gram of body weight having succumbed. Adult worms persisted in the intestines of most animals for long periods of time, 13 weeks being the maximal period observed. Five gophers that were reinfected showed no resistance to the test doses of larvae that were employed.

The snowshoe hare a new host of *Dermatoxys veligera* and *Nematodirus Leporis*, A. B. ERICKSON (*Minnesota Sta. Rpt. 1941*, pp. 39-40).—The nematode parasites *Dermatoxys veligera* to the number of 42 and *Nematodirus leporis* to the number of 33 are recorded as having been found by the author to infest a single snowshoe hare (*Lepus americanus phaeonotus*) collected at Lake Alexander in June 1934 and 10 specimens of *D. veligera* to infest a hare collected near Lake Mille Lacs in January 1933.

Rat mite dermatitis in Minnesota, W. A. RILEY. (Univ. Minn.). (*Minn. Med.*, 23 (1940), No. 6, pp. 423-424).—The tropical rat mite, which is the cause of a severe dermatitis and has been reported as a vector of epidemic typhus in Texas, with more than 200 cases brought to attention, is for the first time reported as far north as Minnesota, where four widely separated localities are cited.

Rat control, G. C. DECKER, H. GUNDERSON, and H. J. BARRE (*Iowa Sta. Bul. P33, n. ser.* (1941), pp. 105-123, figs. 13).—A practical account of the rat, its economic importance and control by means of poison baits, fumigation, and traps, and of methods of rat-proofing farm buildings.

Food habits of the prairie spotted skunk in southeastern Iowa, W. D. CRABB. (Iowa Expt. Sta. coop. Iowa State Col. et al.). (*Jour. Mammal.*, 22 (1941), No. 4, pp. 349-364, figs. 11).—Report is made of an investigation of the food of *Spilogale interrupta* (Raf.).

The stomach worm *Obeliscooides cuniculi* in the woodchuck, F. G. WALLACE. (Univ. Minn.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 1, p. 92).—The stomach worm *O. cuniculi* of domestic and wild rabbits, in which host it has been found in various parts of the country, is recorded as found in the stomachs of six woodchucks collected in Minnesota in numbers from 6 to 128.

Analysis of losses in the nesting of birds, S. C. KENDEIGH. (Univ. Ill. et al.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 1, pp. 19-26, fig. 1).—Report is made of the percentage of successful and unsuccessful outcomes in 2,725 nesting attempts of 51 species of mostly forest-edge birds and the percentage of all eggs laid to develop into fledglings, based upon observations near Cleveland, Ohio.

The role of the burrowing owl and the sticktight flea in the spread of plague, C. M. WHEELER, J. R. DOUGLAS, and F. C. EVANS. (Univ. Calif.). (*Science*, 94 (1941), No. 2450, pp. 560-561).—Report is made of a plague epizootic in progress among ground squirrels (*Citellus beecheyi*) of Kern County, Calif., during the spring and summer of 1941. Among fleas collected from the ground squirrels in nearby areas was the sticktight flea, a species of extremely wide geographical and hostal occurrence in the United States. It was abundant on chickens and other domestic fowl, on rats and various wild rodents, and on such predators as the coyote, Cooper's hawk, and burrowing owl. One of these hosts, the burrowing owl (*Speotyto cunicularia*), taken on a ranch about 5 miles west of the plague area, yielded 70 individuals of this flea, which upon mass inoculation into a test guinea pig proved to be infected with

plague organisms. This appears to be the first record of a bird host as a carrier of plague-infected parasites and the first demonstration of natural plague infection in this species of flea.

The susceptibility of sage grouse to strychnine, J. C. WARD, M. MARTIN, and W. ALLRED (*Jour. Wildlife Managt.*, 6 (1942), No. 1, pp. 55-57).—In the experiments conducted the sage grouse did not voluntarily eat poisoned grain, and when it was force-fed it tolerated quantities so large that it is believed that the exposure of strychnine in this form is no hazard for these birds. Since under normal conditions the grouse ate small quantities of alfalfa leaves treated with strychnine and the amounts eaten were increased when the birds were starved, this bait should be used with caution.

Devise control for disease of trout (*Wisconsin Sta. Bul.* 453 (1941), p. 63).—Reference is made to the development by L. L. Gee and W. B. Sarles of a method which makes use of acriflavine in disinfecting trout eggs to control furunculosis, a disease due to *Bacterium salmonicida*, which has killed from 80 to 95 percent of the fish in some hatcheries.

The polyclad *Hoploplana inquilina thaisana* Pearse, 1938, from the mantle cavity of oyster drills, L. A. STAUBER. (N. J. Expt. Stas.). (*Jour. Parasitol.*, 27 (1941), No. 6, pp. 541-542).

Entomological nomenclature and literature, W. J. CHAMBERLIN (*Ann Arbor, Mich.: Edwards Bros.*, 1941, pp. IX+103, [figs. 2]).—Part 1 of this work deals with entomological nomenclature (pp. 1-44) and part 2 with entomological literature (pp. 45-103).

[Work in entomology of the Department] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1941, pp. 233-237).—The military importance of war on insects, defense applications of entomology, and tests of new insecticides are discussed.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1941, E-541, pp. 8; E-542, pp. 4; E-543, pp. 8; E-544, pp. 8; E-545, pp. 18, pl. 1; E-546, pp. 14; E-547, pp. 5; E-548, pp. 12; E-549, pp. 11; E-550, pp. 8).—The following contributions are in continuation of this series (E. S. R., 85, p. 501): Control of Dog Fly Breeding in Beach Deposits of Marine Grasses, by S. W. Simmons and W. E. Dove (E-541); Control of Dog Fly Breeding in Peanut Litter, by W. E. Dove and S. W. Simmons (E-542); Further Results From Airplane Dusting in Arizona for Hemipterous Cotton Insect Control, Crop Season of 1940, by T. P. Cassidy and T. C. Barber (E-543) (E. S. R., 80, p. 365); Toxicity of Pyrethrins I and II in Kerosene to the American Cockroach, by E. R. McGovran, E. L. Mayer, and F. Acree, Jr. (E-544); A Report of Investigations of the Extent and Causes of Heavy Losses of Adult Honeybees in Utah, by A. P. Sturtevant, G. F. Knowlton, J. D. Hitchcock, G. H. Vansell, E. C. Holst, and W. P. Nye (E-545) (coop. Utah and Wyo. Expt. Stas.); An Experimental Cooperative Community Program for the Cultural Control of Bugs of the Genus *Lygus* on Alfalfa Seed Crops in the Mohawk Area of Arizona in 1939 and 1940, by L. L. Stitt (E-546) (coop. Univ. Ariz. et al.); The Corn Earworm on Lima Beans and Its Control, by L. W. Brannon (E-547) (coop. Va. Truck Sta.); Phthalonitrile as an Insecticide, by M. C. Swingle, J. B. Gahan, and A. M. Phillips (E-548); 1,4-Diphenyl Semicarbazide as an Insecticide, by J. B. Gahan, M. C. Swingle, and A. M. Phillips (E-549); and *p*-Aminoazobenzene Hydrochloride as an Insecticide, by A. M. Phillips, M. C. Swingle, J. B. Gahan, and E. R. McGovran (E-550).

[Entomological investigations by the Georgia Station] (*Georgia Sta. Rpt.* 1941, pp. 112-119, figs. 3).—A report which mentions progress (E. S. R., 84, p. 74) on the cowpea curculio, tomato fruitworm, southern corn rootworm,

Mexican bean beetle, green June beetle, green bug, bollweevil, pale-striped flea beetle, and the wooly alder aphid.

[A report of entomological work in South Australia in 1940] (*Univ. Adelaide, So. Austral., Waite Agr. Res. Inst. Rpt., 1939-40, pp. 35-39*).—The work considered relates to grasshopper problems, several agricultural and horticultural crop pests, and insects affecting stored foodstuffs and stored wheat.

Insects as carriers of poliomyelitis virus, C. T. BRUES (*Science, 95 (1942), No. 2459, pp. 169-170*).

Control of insects and mites attacking narcissus bulbs, C. F. DOUCETTE (*U. S. Dept. Agr., Farmers' Bul. 1890 (1941), pp. [2]+25, figs. 22*).—This publication discusses the stages, seasonal development, and nature of attack of the narcissus bulb fly, the lesser bulb fly, *Eumerus strigatus* Fallen, *E. narcissi* Smith, the bulb mite, and the bulb-scale mite *Tarsonemus laticeps* Halbert. General control measures, including fumigation and hot-water and vapor-heat treatment, are summarized.

Insecticidal efficiency of some oils of plant origin, A. W. CRESSMAN and L. H. DAWSEY (*U. S. Dept. Agr., Tech. Bul. 801 (1942), pp. 15, figs. 4*).—Certain oils of plant origin were compared for insecticidal efficiency with a refined petroleum oil. Crude cottonseed, crude corn, and peanut oils on the basis of equivalent oil deposits were equal or superior to petroleum oil for Mexican mealybug control, and crude corn oil gave higher kills and heavier oil deposits than petroleum on the willow scurfy scale *Chionaspis salicis-nigrae* (Walsh) and the oystershell scale. Refined corn oil was less effective than petroleum oil for Mexican mealybug and oystershell scale control. In the case of the oystershell scale and *C. salicis-nigrae*, percentage of survival increased with density of infestation. For mealybugs, refined cottonseed oil was less effective than petroleum oils. Coconut oil plus petroleum oil gave smaller oil deposits and killed fewer mealybugs than an equivalent concentration of petroleum oil alone. Orange and pine oils were volatile, severely injured chrysanthemum plants, and had little effect on mealybugs. Tests indicated ovicidal efficiency was correlated with drying properties. Crude corn oil deposits were from 60 to 100 percent higher than those obtained from equivalent concentrations of other oils. Plant tolerance to different oils varied considerably. It was suggested that although vegetable oils are generally higher priced than petroleum oils they possess superior solvent action for certain organic insecticides and may find new uses because of this property.

Plantas ictiotóxicas: Farmacologia da rotenona [Ichthyotoxic plants: Pharmacology of rotenone], C. E. CORBETT ([*Sao Paulo*]: *Univ. Sao Paulo, 1940, pp. 157, pls. 24; Eng. abs., pp. 150-152*).—The first part of this work (pp. 5-73) emphasizes the importance of studies of fish-poisoning plants and reports upon the active principle rotenone, its extraction and standardization, and experimental studies recorded in the literature. Part 2 (pp. 75-148) deals with the new work on rotenone toxicity, including experiments conducted with both invertebrates and vertebrates. Ninety-one references to the literature are included in a bibliography.

Two genera of Symphyla new to the United States, with descriptions of three new species, A. E. MICHELbacher. (*Univ. Calif.*). (*Ann. Ent. Soc. Amer., 34 (1941), No. 1, pp. 139-150, figs. 4*).—Three species representing the genus *Symphylellopsis* are described as new, and notes are given on the genus *Geophillella* and the species *G. americana* (Hilton).

Life history notes on some West Indian coenagrionine dragonflies (Odonata), J. G. NEEDHAM (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 25 (1941), No. 3, pp. 18, pl. 1*).

Roach control: A study of the relative efficiency of various commonly used insecticide dusts against roaches, H. LAUDINI and H. L. SWEETMAN. (Mass. State Col.). (*Soap and Sanit. Chem.*, 17 (1941), No. 6, pp. 129, 131, 133, 135).—In the tests reported the German cockroach was found much easier to kill than the American cockroach. Sodium fluoride was the most effective against the German cockroach, but was slightly less effective against the American cockroach. Pyrethrum alone was not very effective against either species in the runway tests, but was very effective if the dusts were applied directly on them. The addition of pyrethrum, from 10 to 33 percent of the total, to sodium fluoride increased the effectiveness of the poisons against the American cockroach and gave complete kills against the German cockroach. Pyrethrum and borax mixtures showed some promise against both species, but the slow action of the borax is objectionable.

The genus *Aeoloplides* (Orthoptera) in Utah, W. W. HENDERSON. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 18 (1940-41), pp. 83-89, pl. 1).—Two of the seven recognized species of Orthoptera of the genus *Aeoloplides* are known to occur in Utah, namely, *A. tenuipennis* (Scudder) and *A. chenopodii* (Bruner).

The cattle lice of Great Britain, I, II, H. J. CRAUFURD-BENSON (*Parasitology*, 33 (1941), No. 3, pp. 331-358, figs. 5).—This contribution is presented in two parts.

I. *Biology, with special reference to *Haematopinus eurysternus** (pp. 331-342).—Record is made of the geographical distribution of cattle lice in Great Britain, of which the cattle biting-louse (*Bovicola bovis*) is the most common and widely distributed species. The incubation period for the eggs was found to be as follows: The short-nosed cattle louse (*H. eurysternus*) 9-19 days (average 12), the cattle biting-louse 7-10 (average 8), *Linognathus vitula* 10-13, and *Solenopotes capillatus* 10-13 days. "With eggs of *H. eurysternus* it was found that the higher the minimum air temperature the shorter was the incubation period. In *H. eurysternus* the average length of the instars was first, 4 days; second, 4 days; third, 4 days; [and] preoviposition period, 3-4 days. The average time for the complete life cycle, egg to egg, was 28 days. The maximum longevity of *H. eurysternus* on the host was males 10 days, female 16 days. No males or females of *H. eurysternus* survived a starvation period of 72 hr. at 20° C. and relative humidity 70, or 0°-10° and r. h. 70-85, but some nymphs survived this period at 20° and r. h. 70, but none survived 96 hours' starvation. The maximum number of eggs recorded for one female was 24, and eggs were laid at the rate of 1-4 a day. The threshold of development of the eggs of *H. eurysternus* appears to be about 27.5°."

II. *Lice populations* (pp. 343-358).—Studies made of monthly examinations of cattle have shown the seasonal variations of the populations of these four species of cattle lice to be similar.

On the biology of *Dysdercus howardi* Ballou.—II, The effect of continued inbreeding on the life history, E. I. MACGILL (*Bul. Ent. Res.*, 32 (1941), No. 3, pp. 185-190).—This continues work noted (E. S. R., 73, p. 814).

The ecology of the bed-bug (*Cimex lectularius* L.) in Britain: Report on research, 1935-40, C. G. JOHNSON (*Jour. Hyg. [London]*, 41 (1941), No. 4, pp. 345-461, figs. 39).

The nature of injury to alfalfa caused by *Empoasca fabae* (Harris), J. T. MEDLER (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 2, pp. 439-450, pls. 2).—It has been shown by a histological study of the feeding punctures of *Aceratagallia sanguinolenta* (Prov.) and *Macrosteles divinus* (Uhl.) that these leafhoppers cause no apparent internal injurious effect in alfalfa leaflets. The nature of

plant injury by the potato leafhopper is unique and a combination of the insect's feeding habit in vascular tissue and the action of a specific compound injected during its feeding process. This secretion causes hypertrophy in affected cells, and its effect is first characterized by nuclear enlargement and prominent safranin-stained nucleoli. It is conceivable that the hypertrophied cells cause an interruption of translocation processes which initiate secondary external symptoms of chlorosis or reddening in alfalfa leaves.

Peregrinus maidis (Ashm.) and the transmission of corn mosaic.—I, Incubation period and longevity of the virus in the insect, W. CARTER. (Hawaii. Pineapple Prod. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 3, pp. 551-556).—In its hemipterous vector *P. maidis* the incubation period of the virus of corn mosaic varies normally from 11 to 29 days, with an equal distribution of cases between these two extremes. Feeding of the insects on an artificial culture solution during the incubation period did not appear to result in any lengthening of the period. The virus persists in the insect and in the majority of cases is transmitted without interruption to a series of plants when 2-day feeding periods are allowed. In some cases breaks in the succession of positive transmittals occurred. The transmittal succession was frequently interrupted by the death of the insect, but some individuals lived for a considerable period following the last positive transmittal, indicating that the virus content of the insect was exhausted. The disease has a latent period of development in the plant as short as 4 days, with a maximum of 24 days when the growth of the test plant was retarded.

The genus **Drepanaphis** Del Guercio east of the Rocky Mountains, C. F. SMITH. (Univ. N. C.). (*Jour. Elisha Mitchell Sci. Soc.*, 57 (1941), No. 2, pp. 226-242, figs. 9).—Of the 10 species of aphids of the genus *Drepanaphis* here considered, 6 are described as new to science. Five species were found by the author on the same sugar maple tree at the same time.

Studies of western aphids, G. F. KNOWLTON. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 18 (1940-41), pp. 65-68).—An annotated list of Aphidae of western United States which includes host plant range and distribution.

The genus **Aspidiotus** (Homoptera: Coccoidea: Diaspididae), G. F. FERRIS (*Microentomology*, 6 (1941), No. 2, pp. 33-69, figs. 8).—Twelve species of the genus *Aspidiotus* are recognized, of which 3 may prove to be synonyms. A list of 530 names, including homonyms, that have at some time or other been employed in *Aspidiotus* and a key to the species are included.

Observations on the morphology of the corn seed beetle **Agonoderus pallipes** Fab. (Carabidae), H. R. BRYSON and G. F. DILLON. (Kans. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 1, pp. 43-50, figs. 17).—A detailed description is given of the adult corn seed beetle *A. pallipes* and a brief description of the egg, larva, and pupa.

Coleoptera associated with stored Nepal barley in Peru, H. E. HINTON (*Bul. Ent. Res.*, 32 (1941), No. 3, pp. 175-183, figs. 7).—Five species are considered, two of which are new. The genus *Eufalloides* is erected.

The Lathridiidae of economic importance, H. E. HINTON (*Bul. Ent. Res.*, 32 (1941), No. 3, pp. 191-247, figs. 67).—A total of 30 species of Coleoptera, family Lathridiidae, have been recorded from stored food products or have been found in warehouses, granaries, or mills. The life histories of five, namely, *Coninomus nodifer* (Westwood), *Enicmus minutus* (L.), *Cartodere flum* (Aubé), *C. filiformis* (Gyll.), and *Corticaria fulva* (Comolli), have been worked out, together with a nearly completed life history of the sixth (*Adistemia watsoni* (Wollaston)). A four-page list of references to the literature is included.

Revision of the bark beetles belonging to the genus *Pseudohylesinus* Swaine, M. W. BLACKMAN (*U. S. Dept. Agr., Misc. Pub. 461 (1942), pp. 32, figs. 3*).—The genus *Pseudohylesinus* is characterized, and a key is included for the separation of the known species. Seven new species are described. The hosts and distribution are recorded for all species. Three pages of figures useful for specific separation are included.

Biology of the black blister beetle (Coleoptera: Meloidae), W. R. HORSFALL. (Ark. Expt. Sta.). (*Ann. Ent. Soc. Amer., 34 (1941), No. 1, pp. 114-126, figs. 10*).—The author has found that the black blister beetle may have either a normal complete metamorphosis or a hypermetamorphosis, and that in either event there are five feeding larval instars that are morphologically very similar. Following them may be two supernumerary instars which do not feed. The sixth instar of coarctate larva is the only one of the seven which does not resemble the others closely. Therefore, there are one or two larval forms accordingly, as there are five or seven larval instars. The whole larval period usually requires about 10 mo. in the field, but in the laboratory the period may be completed within an average of 28 days. In the field the greater part of the period may be spent as an egg, a first-instar larva, or as a sixth-instar larva. Adults of this species emerge in late summer and may be collected until mid-November in northwestern Arkansas. They feed on the pollen of goldenrod and asters and not on foliage. Eggs are deposited in masses of about 165 eggs at the bottom of tubular cavities in the soil. These hatch in about 15 days under favorable conditions, or hatching may be delayed some months during unfavorable temperatures. Larvae feed on eggs of grasshoppers.

Raspberry fruitworms and related species, H. S. BARBER (*U. S. Dept. Agr., Misc. Pub. 468 (1942), pp. 32*).—A key is presented for distinguishing 13 named forms of raspberry fruitworms, including 4 from Europe, 2 from Asia, and 7 from the United States. Specific and generic names for the group are discussed. Descriptions, notes, and records for the forms mentioned, a chronological review of the literature involved, and names used in this discussion of *Byturus* are also included.

The sand wireworm, J. N. TENHET (*U. S. Dept. Agr. Leaflet 212 (1941), pp. 8, figs. 6*).—A practical account.

Monograph of the South American weevils of the genus *Conotrachelus*, K. FIEDLER (*London: Brit. Mus. (Nat. Hist.), 1940, pp. V+365, [pl. 1, figs. 57]*).—This work deals with weevils of the curculionid genus *Conotrachelus* of South America, which are separated into six groups and numerous subgroups. A table for the separation of the groups and tables for the separation of the species of each subgroup are included. Five hundred and fifty-five species are recognized, of which 409 are described as new. The body of the work appears in German.

Control of strawberry root-infesting weevils, G. F. KNOWLTON and R. L. JANES. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 18 (1940-41), pp. 47-53, figs. 3*).—In control experiments with poisoned baits sodium fluosilicate gave better results than calcium arsenate or sodium fluoride, whether combined with ground dried apples, raisins, or prunes plus bran or used with bran alone. It is pointed out that any carrier used may be combined with any chemical listed without materially changing the value of the chemical as a bait insecticide. First baiting should be done approximately 12 to 14 days after adult weevil emergence begins and before any eggs are laid. Baiting is necessary during the picking season and should not be postponed until after the strawberry crop is harvested. A second baiting treatment should be applied approximately 2 weeks after the first; this to destroy later emerging weevils and those missed by the first control application. In an appended note it is pointed out that during

the season of 1940 a number of farmers in Utah County applied grasshopper bait consisting of wheat bran 400 lb., sodium arsenite—4 lb. material—2 gal., and water from 35 to 45 gal. to their strawberry root weevil-infested fields, the applications being made with a teaspoon in a manner similar to that in which a poisoned dried-fruit bait is applied, and obtained substantial control. It is concluded that this type of bait, if satisfactory, would be less expensive and more easily prepared than any of the dried-fruit baits.

Topping cotton in early fall as a possible means of reducing the spring boll weevil population in the northwestern part of the Florida sea island cotton belt, P. W. CALHOUN (*Fla. Ent.*, 24 (1941), No. 2, pp. 35-40).

The utilization of certain nitrogenous and carbohydrate substances by the southern armyworm (*Prodenia eridania* Cram.), H. H. CROWELL (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 2, pp. 503-512, fig. 1).—Description is given of a method by which known quantities of bean leaves raised under standard conditions of light, moisture, and nutrition could be fed to fifth- and sixth-instar larvae of the southern armyworm. Under laboratory conditions southern armyworm larvae of the last two instars (fifth and sixth) were found to consume 97 percent of the total amount of food eaten during larval development. On dry weight basis, 10.787 gm. of food eaten by 60 larvae during the last two instars produced 5.5504 gm. of excrement with a gain in weight of larvae of 3.6183 gm. This represents 48.5-percent efficiency of utilization and 33.5-percent efficiency of conversion of foodstuff into dry body weight. Chemical analyses of the food leaves and excrement of fifth- and sixth-instar southern armyworm larvae showed that this insect utilizes most of the protein, reducing sugars, and sucrose in the leaves. They also use the nitrogen of naturally occurring amino acids and amides, but do not use nitrate nitrogen. Starch is not utilized, although the presence of a starch-splitting enzyme was verified.

Fruitworm control (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 12, p. 7).—Experiments with two dust preparations for the control of the tomato fruitworm showed a reduction of injury with 50 percent Kryolite, while 8 percent Rotenone was ineffective.

A luminous fly larva with spider traits (Diptera: Mycetophilidae), B. B. FULTON. (N. C. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 2, pp. 289-302, pls. 2).—A study of the mycetophilid dipteran *Platyura fultoni* Fisher, luminous larvae of which have been found in wet, shaded places about springs and streams in the southern Appalachians, is reported. One larva was found parasitized by an undescribed species of an internal hymenopterous parasite of the genus *Dallatorrea*.

Synopsis of the tachinid flies of the genus *Tachinomyia*, with descriptions of new species, R. T. WEBBER (*U. S. Natl. Mus. Proc.*, 90 (1941), No. 3108, pp. 287-304, fig. 1).—Nine species of tachinid flies of the genus *Tachinomyia* are recognized, of which four are described as new.

The interconversion of foodstuffs in the blowfly (*Phormia regina*) during metamorphosis, I-III. (Ohio State Univ.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 1, pp. 17-37, figs. 4).—This contribution is presented in three parts as follows: Part 1, Respiratory Metabolism and Nitrogen Excretion, by F. A. Hitchcock and J. G. Haub (pp. 17-25); part 2, Changes in Composition as Determined by the Oxycalorimeter, by M. B. Patton, F. A. Hitchcock, and J. G. Haub (pp. 26-31); and part 3, Chemical Composition of Larvae, Pupae, and Adults, by J. G. Haub and F. A. Hitchcock (pp. 32-37).

The carrot rust fly (*Psila rosae* Fabr.), A. J. HANSON and R. L. WEBSTER (*Washington Sta. Bul.* 405 (1941), pp. 24, figs. 10).—This pest was first recorded in Washington in 1908 but did not cause serious damage until 1928. It appar-

ently has a rather wide distribution in the Pacific Northwest. Important cultivated hosts are carrots, parsnips, celery, and parsley. Damage to these is caused by larvae feeding upon the root system. Larvae or puparia overwinter in the soil, and adults emerge during April, May, and June. The adults mate, and females deposit eggs near the base of plants. Eggs pass through an incubation period of 4 to 7 days. Larvae feed for about 30 days and transform to pupae during July. Adults of these appear about July 15. Second-brood larvae occur in late August and early September. Winter mortality reduces the population so that damage from spring-brood larvae is usually slight. If planting is deferred until late May or early June less damage occurs. Crude naphthalene flakes was the only satisfactory insecticide tested.

Preliminary experiments on the control of the holly leaf miner, A. HARTZELL and G. F. MCKENNA (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 2, pp. 119-126, fig. 1).—Tests of a series of sprays and dusts for their efficiency in the control of the holly leaf miner, the most serious insect pest of holly in eastern North America, are reported. A spray consisting of 2 qt. of fish oil and 1 qt. of nicotine sulfate made up to 100 gal. with water sprayed on the foliage gave a reduction in mines of 91 percent in field plats at Yonkers, N. Y., as compared with the unsprayed check. Spray applications were made the second and third weeks in May, followed by an application about the middle of June and a final application around the middle of July.

Notes on two genera of American flies of the family Trypetidae, J. R. MALLOCH (*U. S. Nat. Mus. Proc.*, 92 (1942), No. 3133, pp. 20, fig. 1).—Notes are presented on 24 species of the genus *Trypanea*, 6 of which are described as new, and on 2 species of the genus *Neaspilota*. Keys for the separation of the species are included. The known records of the food habits of the larvae are included.

Three new Dufoureae bees from California (Hymenoptera: Apoidea), P. H. TIMBERLAKE. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 1, pp. 38-42).

A monograph of the genus Chyphotes (Hymenoptera: Mutillidae: Apterogyninae) of North America, A. W. BUZICKY. (Minn. Expt. Sta.). (*Ent. Amer.*, 21 (1941), No. 4, pp. 201-243, figs. 13).—Of the 26 species of the mutillid genus *Chyphotes* recorded, 12 are described as new.

Podagrion mantis Ashmead and other parasites of praying mantid egg cases (Hym.: Chalcidoidea; Dipt.: Chloropidae), O. P. BRELAND (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 1, pp. 99-113).—Biological data are presented for four species of mantid egg parasites, namely, *P. mantis*, *Eupelmus coccidis* Gir., *Anastatus reduvii* (How.), and *Pseudogaurax signata* (Lw.), as observed in the vicinity of Austin, Tex., during the fall and winter of 1938-39 and 1939-40. All of these insects were reared from the egg cases of the Carolina mantis. *P. mantis* is a true external parasite of the individual mantid egg, and this is probably true for *E. coccidis*. *A. reduvii*, however, is an internal parasite, and all stages are passed within the mantid egg.

A new chalcidoid parasite of the vetch bruchid, A. B. GAHAN. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 44 (1942), No. 1, pp. 8-10).—Under the name *Tetrastichus bruchivorus* description is given of a new chalcidoid parasite of the vetch bruchid. It was reared from weevil-infested vetch collected in the Department of Var, France; from *Bruchus ulicis* M. & R. in the same French department; at quarantine in Philadelphia in seeds of vetch originating in Italy that were infested with *B. ulicis*; and from the vetch weevil collected at Statesville, N. C.

The life cycle of Apanteles carpatus (Say) (Hymenoptera: Braconidae), a parasite of the webbing clothes moth (Tineola bisselliella Hum.),

A. M. FALLIS (*Canad. Jour. Res.*, 20 (1942), No. 1, Sect. D, pp. 13-19, figs. 17).—Observations on the life history and habits of *A. carpatus*, a parasite of the larvae of the webbing clothes moth, are reported. Oviposition occurred and parasites developed in host larvae weighing from 1.6 to 6.8 mg. The parasites oviposited more readily in a host enclosed in a case, especially if the case contained fecal pellets of the host. Eggs were deposited in various parts of the host. A single parasite developed to maturity even though several eggs may have been deposited in the host, each by a separate "thrust" of the ovipositor. The rate of development was found to vary even at constant temperature. The average length of the life cycle at 27° C. was 26 days, but at 20° it required several months. Experiments were carried out to determine the factors responsible for the variation in the rate of development. The parasite larva upon emerging from the host usually spins a white silken cocoon, although metamorphosis was sometimes completed even though no cocoon was produced.

Observations on certain lepidopterous and hymenopterous parasites of Polistes wasps, P. RAU (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 2, pp. 355-366).—Following a recital of records (1) of lepidopterous parasites, (2) of moths known to prey upon *Polistes* wasps, and (3) of moths whose habits resemble those of *Diacymolomia pegasalis* Wlk., observations of the life histories of the pyralid moths *D. pegasalis* and *Chalcoela iphitalis*, new records of hymenopterous parasites, and records for 1939 are reported. The caterpillars of both *D. pegasalis* and *C. iphitalis* feed on the larvae of *Polistes* wasps, the former on three species and the latter on two species.

A new species of hymenopterous parasite of the pea aphid (*Macrosiphum pisi* Kaltenbach), C. F. SMITH. (Univ. N. C.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 3, pp. 537-538).—Under the name *Aphidius pisivorus* a parasite reared from the pea aphid from many localities in Utah is described as new.

On the taxonomic status of *Gilpinia polytoma* (Htg.) and *G. hercyniae* (Htg.) (Hymenoptera: Diprionidae), W. A. REEKS (*Canad. Ent.*, 73 (1941), No. 10, pp. 177-188, figs. 44).—Studies conducted with the view to establishing the correct nomenclature and provide adequate descriptions of the two species of sawflies which hitherto have been included under the name *G. (Lophyrus, Diprion) polytoma* (Htg.) 1834 are reported. It is shown that *G. hercyniae* (Htg.) 1837 is the form which has been introduced into North America and has seriously injured spruce forests in northern New England and eastern Canada. *G. polytoma* is arrhenotokous (facultative parthenogenesis) and is known only from Europe, while *G. hercyniae* is thelytokous (obligatory parthenogenesis) and occurs in Europe and America. The distribution in Canada includes the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island. In the United States it occurs in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and New York.

Separation of the European spruce sawfly in America from *Gilpinia polytoma* (Htg.) (Diprionidae: Hymenoptera) and evidence of its introduction, R. E. BALCH, W. A. REEKS, and S. G. SMITH (*Canad. Ent.*, 73 (1941), No. 11, pp. 198-203).—In reporting further (see above) it is pointed out that the so-called European spruce sawfly which was discovered in Canada in 1930 and has been known as *G. polytoma* represents another species (*G. hercyniae*).

Of the two distinct species of spruce sawfly which occur in Europe hitherto included under the name *G. polytoma*, one (*G. hercyniae*) has the thelytokous method of reproduction, with a tendency to frequent and sustained diapause and a habit of spinning its cocoon in the forest floor. The female has 14 chromosomes, the male 7, and they can both be distinguished almost invariably from the other species by characters in the genitalia although no other morphological characters

are reliable. The other species (*G. polytoma*) has the arrhenotokous type of reproduction, with little or no tendency to diapause and a habit of spinning most of its cocoons above ground. The male has 6 chromosomes, the female 12. The spruce sawfly in Canada is identical with the European thelytokous species and appears to have been introduced from Europe. This conclusion regarding introduction is based on the brevity of its recorded history on this continent, on its distribution and the spread of the outbreak, on the almost complete failure of native parasites to attack it, and on the fact that a closely related bisexual form from which it is likely to have derived, or which originated from a common progenitor, exists in Europe but not in America.

The diapause and related phenomena in *Gilpinia polytoma* Hartig), III-V, M. L. PREBBLE (*Canad. Jour. Res.*, 19 (1941), Nos. 11, Sect. D, pp. 350-362, figs. 5; 12, Sect. D, pp. 417-454, fig. 1).—Further contributions are presented (*E. S. R.*, 86, p. 364).

III. Bioclimatic relations (pp. 350-362).—Description is given of the progress of intracocoon development in relation to temperature and moisture for a one-generation and a two-generation area of the European spruce sawfly in eastern Canada (= *G. hercyniae*; see article by Reeks above). In the one-generation area (central Gaspé) the degree of seasonal emergence from the overwintered cocoons can be forecast with considerable accuracy by means of sample analyses during the period of pronymphal and early pupal development. This is possible since few individuals that have not initiated development by late June do so later in the summer even though environmental conditions are quite favorable. The technic fails in a two-generation area (south-central New Brunswick) because members of the overwintered population may continue to respond to favorable temperature and moisture conditions throughout the entire season.

On the basis of biologic and climatic data the area occupied by the European spruce sawfly in eastern North America is divided into zones representing the probable distribution of one-, two-, and three-generation areas. Intermediate transitional zones are also indicated.

IV. Influence of food and diapause upon reproductive capacity (pp. 417-436).—In this work methods of sampling, determination of reproductive capacity, and analysis of data are considered. Various physical measurements are positively correlated with reproductive capacity, but regression equations are unsatisfactory for estimation of fecundity outside of the population in which the relationships have been determined, due to variability in the degree of joint variation of size and fecundity under different feeding conditions. Field populations developed on white spruce are more fecund than those developed on black spruce; reductions of 30 percent or more may result from periodic food shortage.

Reproductive capacity of females emerging over a period of 3 to 5 yr. in each of 20 populations failed to show any consistent trend in relation to the diapause period. From this and also from the slight reduction in eonymphal dry weight over extended intervals at favorable temperature it is concluded that the destruction of eonymphal reserves during diapause proceeds very slowly and has no practical effect upon fecundity of females issuing after prolonged diapause.

V. Diapause in relation to epidemiology (pp. 437-454).—This final paper in the studies on diapause in the spruce sawfly describes the direct and indirect influences of diapause on epidemiology in different parts of the distribution range in eastern North America. These relate to duration of diapause, degree of diapause in overwintered cocoons, and proportions of the population surviving to participate in the continuation of the infestation. The nature of infestations in different areas is described briefly.

A discussion of features of intraspecific differences and a summary of conclusions derived from all five papers in the series are also included.

Ornithodoros parkeri and relapsing fever spirochetes in Utah, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 52, pp. 2464-2468, fig. 1).—Of 49 lots of ticks, ranging from 1 to 59 specimens (total 306), and collected in 16 counties of Utah, all but 1 were *O. parkeri*. A single specimen collected in San Juan County was *O. turicata*, this being the first record of its occurrence in Utah. Of 235 ticks that survived for testing, spirochetes were recovered from 7 lots from 4 counties, based upon a single test feeding upon white mice. Two cases of relapsing fever have been reported in Utah, one in 1928 and the other in 1930.

A note on the bionomics of Ixodes ricinus L., M. L. BINGHAM (*Parasitology*, 33 (1941), No. 3, pp. 316-319).—In observations on the life cycle of the castor-bean tick some larvae were found to undergo a prolonged metamorphosis into nymphs in periods of 341, 354, and 361 days between the start of larval engorgement and nymphal emergence.

Two new species of ticks from British Columbia (Ixodidae), J. D. GREGSON (*Canad. Ent.*, 73 (1941), No. 12, pp. 220-228, pls. 2, figs. 2).—Two ticks of the genus *Ixodes*, *I. hearlei* from the interior red squirrel (*Tamiasciurus hudsonicus streatoris*) and *I. ochotonae* from *Ochotona princeps* ssp., *Peromyscus* sp., and *Neotoma cinerea* ssp., are described from British Columbia.

Effect of length of day on the activity and hibernation of the American dog tick (Dermacentor variabilis (Say)) (Acarina: Ixodidae), C. N. SMITH and M. M. COLE. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 34 (1941), No. 2, pp. 426-431).—The length of day is an important factor in controlling the activity or hibernation of larvae and nymphs of the American dog tick. Long photoperiods are more favorable to activity than short ones and gradually increasing photoperiods more favorable than gradually decreasing ones of even greater absolute length.

The transmission of Theileria parva by ticks, E. A. LEWIS and W. FOTHERINGHAM (*Parasitology*, 33 (1941), No. 3, pp. 251-277, figs. 19).—Report is made of experiments conducted in continuation of those previously noted (E. S. R., 78, p. 696) which deal with the effect of low temperature on the development of *T. parva* in engorged larvae of *Rhipicephalus appendiculatus*. Reference is made to records of mild reactions to East Coast fever when the parasites are either rare or absent, and instances are given of such reactions followed by recovery in experimental animals. Although the mild form of the disease seems associated at times with light tick infestation, it is proved that a few infected ticks also transmit a fatal East Coast fever. It is shown also that ticks fed on a bovine during a short or mild reaction can produce a virulent form of the disease in susceptible animals, and that mild reactors acquire an immunity to the virulent disease. The experiments indicate that ticks do not become infected with *T. parva* from the blood of a bovine for the first 4 days of the reaction period. Evidence is produced which strongly suggests that *T. parva* tends to disappear from infected hungry ticks kept under laboratory conditions for about a year or more. The age of the tick would appear to be an important factor in the transmission of East Coast fever. Attempts to break down the immunity to East Coast fever and to produce "turning-sickness" by massive infestations of ticks were unsuccessful, and further experiments on the transmission of East Coast fever by ticks which had fed on animals suffering from turning-sickness did not confirm earlier positive results.

The differentiation of the eggs of the trichostrongylid species Nematodirus filicollis and N. spathiger, J. H. TETLEY (*Jour. Parasitol.*, 27 (1941), No. 6, pp. 473-480, figs. 5).

ANIMAL PRODUCTION

Temperature factors in animal production, S. BRODY. (Univ. Mo.). (In *Temperature—Its Measurement and Control in Science and Industry. New York: Reinhold Pub. Corp., 1941, pp. 462-473, figs. 10*).—The influence of environmental conditions and sweating on heat production by several classes of animals is discussed.

[**Experiments with cattle, sheep, and swine by the Georgia Station**] (*Georgia Sta. Rpt. 1941, pp. 70-77, 78, 90-98, 109, figs. 2*).—Results are presented on studies of the effect on gains and quality and grade of carcass of steers of supplements of peanut meal to pasture and of sorghum silage, ground and whole peanut hay, lespedeza hay, cottonseed hulls, peanuts and vines, and potato meal when fed with corn and cottonseed meal rations; cottonseed meal, peanut meal, lespedeza hay, peanut hay, oat straw, and silage for wintering beef cattle; creep feeding calves; sweetpotatoes and vines stored in pit silos; relation of temperature and the breed of ram to breeding of ewes; peanuts, peanut meal, and hay from vines for pork production; production of total digestible nutrients and gains from fertilized and unfertilized pastures; and comparison of clovers and carpet-grass for pasturing steers at Jonesboro.

The feeding of livestock, H. E. WOODMAN (*Jour. Roy. Agr. Soc. England, 102 (1941), pp. 66-81*).—A summary of nutrition of cattle, poultry, sheep, swine, and horses is given, together with a description of the nutritive value and composition of byproducts of pea canning.

Feeding dried nettles to livestock, W. KING WILSON (*Nature [London], 147 (1941), No. 3739, pp. 796-798*).—Results are reported of a study in which the hay cut from poultry pens and fed to one group of 10 rabbits was replaced in another lot of 10 animals with nettles cut and dried for from 3 to 4 weeks. The group receiving the nettles, although limited to the same feed consumption as the hay-fed group, made 17 percent greater gain during an 8-week feeding period than the controls. The nettles when cut and dried proved to be a satisfactory and palatable substitute for the hay.

[**Pasture comparisons with pigs and cattle at the Delta substation**] (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 12, p. 5*).—Although a ration of 70 parts corn meal and 30 parts cottonseed meal produced cheaper gains in pigs with soybean pasture than a ration of corn meal 85 parts, cottonseed meal 7.5, and tankage 7.5, the finish of the pigs was not quite equivalent to pigs on the standard ration. Some stiffness developed in pigs on the oat pasture with different amounts of cottonseed meal as a protein supplement, but there was no correlation with the amount of cottonseed meal fed since stiffness was least prevalent in the lots receiving the most and the least cottonseed meal. The largest gains were made by pigs receiving a ration of 85 parts corn and 15 parts cottonseed meal. The best finish was produced on the oat pasture and corn without protein supplement, but such pigs did not have a well developed bone and frame, and larger amounts of feed were required than when a protein supplement was fed. Dallis grass and white dutch clover appeared to furnish the most palatable grazing for the greatest number of days for cattle of any of several permanent pasture grasses.

Crotalaria for forage. (Coop. U. S. D. A.). (*Florida Sta. Bul. 361 (1941), pp. 72, figs. 17*).—This is a comprehensive review of the production of and value of crotalaria as a feed for livestock.

In part 1, on Production of *Crotalaria* for Forage, by G. E. Ritchey and R. McKee, 11 species of *Crotalaria* used in the investigation are described. Pasture studies with dairy cows showed that *C. incana* planted in rows was grazed most

consistently early in the season, but later became woody, though making good recovery from grazing. *C. intermedia*, which ranked second in palatability and appeared less fibrous, was preferred as a pasture crop because of its abundant foliage and ability to hold leaves until reasonably late in the season. Cultural studies of seeding methods of *C. intermedia* showed that the finest quality of forage was obtained from seedings of 5-7 lb. per acre in 3-ft. drills. Natural curing produced a coarse, stemmy, woody hay, but the quality was improved by cutting and curing in an artificial drier. In comparative tests of different species of *Crotalaria* for silage the highest yields in 1932 were obtained from *C. spectabilis* and by *C. goreensis* in 1933. The maximum yield of *C. intermedia* desired for silage was produced by harvesting in the bud stage.

Part 2, by R. B. Becker, W. M. Neal, and P. T. Dix Arnold, discusses the value of crotalaria as feed. In palatability trials by dairy cows in grazing the more tender forage was preferred. In palatability studies of hay, dairy cattle showed preference to soybeans over species of *Crotalaria*. *C. intermedia*, *C. incana*, and *C. lanceolata* ranked in that order in free choice consumption from racks in 1931, 1932, and 1933. Considering preferences for silages, *C. intermedia* ranked well in the different years. In the prebud stage the fiber content was in the range with common hay crops (27-33 percent), but at later stages more fiber was present. Details of digestion trials with *C. intermedia* hay and silage previously reported (E. S. R., 74, p. 81) are discussed. Feeding and grazing studies were carried on also with mules. Some toxicity to cattle, mules, swine, fowls, and game birds from *C. spectabilis* was found due to the presence of an alkaloid—"monocrotaline." These findings indicate that neither the green forage, hay, or silage of *C. spectabilis* should be offered to livestock.

Destruction of carotene and vitamin A by certain feeds, G. S. FRAPS, W. W. MEINKE, R. REISER, and A. R. KEMMERER. (Tex. Expt. Sta.). (*Food*, 10 (1941), No. 117, p. 196).—A survey showed some feeds had the power of destroying carotene in dry contact while others did not. Autoclaving meat scraps removed the carotene-destroying power.

Inspection of commercial feedstuffs, P. H. SMITH (*Massachusetts Sta. Control Ser. Bul. 110* (1941), pp. 64).—The usual compilation (E. S. R., 84, p. 798) is given of the guaranteed and found analyses of 1,744 feed samples officially examined in Massachusetts up to September 1, 1941, together with analyses of 12 samples of vitamin D feeds and 9 samples of feeding molasses.

The use of nitrite in meat preservation, T. M. FERNANDEZ (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 4, pp. 371-380, figs. 3).—Within 15 days there was almost complete penetration of hams, bacon, and tongues by sodium nitrite, and it is recommended that sodium nitrite be used in place of potassium nitrite in sweet-pickle- and dry-cured hams and bacons.

[**Sheep breeding at the Delta substation**] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 12, p. 5).—Topcrossing native and mixed ewes with Hampshire rams increased wool production.

Chemical composition of the bones of sheep in Western Australia, E. J. UNDERWOOD (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 4, pp. 405-408).—The calcium, phosphorus, and nitrogen analyses of the long bones of ewes (2.5 to 3 yr. of age) which had been grazing on dry feed were not significantly different from the long bones of ewes grazing on the same feed with phosphorus supplements. Analyses are presented for the long bones of eight ewes on the dry feed and three with a phosphorus supplement and of the humerus, femur, certain ribs, and vertebrae of wethers on dry feed.

Trends in mohair production in Texas, J. M. JONES. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser*, 11 (1941), No. 11, pp. 10, 35, 36, 37, 39).—

A popular account is given of estimates in mohair production in seven Western States in 1940.

The potassium requirements of growing pigs, E. H. HUGHES and N. R. ITTNER. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 3, pp. 189-192, fig. 1).—Since pigs appeared to need K for optimum growth, the purified ration employed in the previous study was supplemented with 0, 2.25, 4.5, and 9.5 gm. of KCl per 100 lb. live weight to indicate the amounts of K required. The results with lots of five pigs each showed that without K supplement the pigs gained slightly and then lost weight after about 4 weeks and generally finally died. The pigs on rations supplemented with 1.18 gm. (2.25 gm. KCl) per 100 lb. of pig gained but the growth rate was less than when 4.5 gm. of K were supplied per day per 100 lb. live weight. It was then considered that 0.08 percent K was not sufficient and 0.15 percent K in the ration was near the requirement.

Pantothenic acid in the nutrition of the pig, E. H. HUGHES. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 3, pp. 185-187, figs. 2).—Pantothenic acid seems necessary for normal growth and well-being in the growing pig. In two experiments, two and five pigs, respectively, on rations lacking pantothenic acid showed an early decrease in appetite, slow growth, and an inability to move about in a normal manner in about 1 mo. With additions of 6.8 mg. of pantothenic acid per 100 lb. of live weight, daily gains of 0.82 and 0.74 lb. were made in the two experiments. Autopsies of the pigs on the deficient rations showed gastritis and inflammation in the large intestine.

The body fats of the pig.—V, Component glycerides of perinephric and outer back fats from the same animal, T. P. HILDITCH and W. H. PEDELTY (*Biochem. Jour.*, 34 (1940), No. 7, pp. 971-979).—Continuing this series,⁵ previously noted in part (*E. S. R.*, 68, p. 800), the authors found that a chemical analysis of the approximate proportions of the groups of glycerides in back and kidney fat samples supports the hypothesis that stearoglycerides in the animal storage fats resulted from the saturation of preformed oleoglycerides. Concurrently the observations disclose a subordinate effect not connected with a hydrogenation mechanism, namely, a gradual increase in the proportions of dipalmitoglycerides as the general degree of saturation of the depot fats becomes more pronounced.

Hog carcass studies: Effect of early rate of growth on leanness of carcass, E. W. CRAMPTON (*Sci. Agr.*, 20 (1940), No. 10, pp. 592-595).—No significant relationships were found in 247 pig carcasses between the rate of gain in live weight and either the length or leanness of the bacon carcass produced. There were differences in rates of gain per day of more than 0.25 lb. and of more than 0.75 lb. in feed intake between the slowest- and fastest-gaining sixths of the population. The data analyzed by variance and covariance do not substantiate the conclusions of McMeekan (*E. S. R.*, 81, p. 403).

A preliminary report on a new system for the identification of horses, J. A. SOLIS (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 4, pp. 345-351, pls. 3).—Methods are described for the identification of horses by taking gutta-percha or photographic prints of the anterior third of the hard palate.

Practical dog feeding, C. J. KOEHN (*Alabama Sta. Bull.* 251 (1942), pp. [1]+23).—The nutritional requirements of the dog, types of diet, recommended home-mixed rations, and the feeding of pups are dealt with in this practical account. The Alabama standard for canned dog food adopted July 18, 1938, is given in the first of two appendixes and the following tables: (1) Chemical composition of recommended rations tabulated by ingredients to show the sources of

⁵ *Biochem. Jour.*, 29 (1935), No. 1, pp. 90-99, fig. 1.

protein, fat, carbohydrate, fiber, calcium, and phosphorus; (2) comparison by age, of body weight and of feed consumed daily by fox hounds receiving dry rations and a good brand of canned dog food; (3) percentage chemical composition of commercial canned dog foods; and (4) formulas which have been tested and found to be unsatisfactory for home-mixed rations are found in the second appendix.

The hatchability of chicken eggs as influenced by environment and heredity, W. LANDAUER ([Connecticut] Storrs Sta. Bul. 236 (1941), pp. 124, figs. 30).—This is a revision of Bulletin 216 (E. S. R., 77, p. 837), summarizing studies on hatchability conducted at the station and other institutions.

The effect of incubation on the vitamin content of eggs, E. E. SNELL and E. QUARLES (*Jour. Nutr.*, 22 (1941) No. 5, pp. 483-489).—Microbiologic assays by the methods of Snell et al. (E. S. R., 85, p. 442) of the vitamin components of eggs at different stages of incubation and after hatching showed that the pantothenic acid and riboflavin contents remained essentially the same, whereas biotin decreased from an average around 68 m γ to about 25 m γ per gram during incubation. Nicotinic acid and inositol are apparently synthesized. Over 20 times the amount of nicotinic acid in the unincubated egg was found in the newly hatched chick. The newly hatched chick contained over 6 times as much inositol as the unincubated egg. It thus appears that the chick does not need nicotinic acid and inositol, but it is not evident if enough is synthesized for optimum growth.

A comparison of wet and dry cooling of dressed poultry, J. ROBERTS and E. I. ROBERTSON (*Washington Sta. Bul.* 403 (1941), pp. 15, figs. 7).—The wet-cooled birds gained weight, and the dry-cooled lost. The wet method cooled more rapidly, and the poultry presented a better appearance and were equal or superior in flavor to the dry-cooled birds. The higher scalding temperatures resulted in the greater weight changes and more discoloration. Discoloration was retarded by plumping, whereas wet cooling prevented discoloration. The appearance of dry-picked poultry was not affected by the method of cooling, and its weight change was less than that of the scalded birds.

Concentrate feeding of turkeys, E. I. ROBERTSON and J. S. CAEVER (*Washington Sta. Bul.* 402 (1941), pp. 16, figs. 3).—High-protein concentrate mixtures containing 39 percent of protein feed with alfalfa range and whole corn, oats, wheat, and barley free choice produced greater weight in broad-breasted Bronze tom and hen turkeys up to 28 weeks of age than was produced by similar groups under confined conditions with a developing mash containing about 20 percent of protein and with a mixture of whole grains. Hens and toms grew similarly and were approximately equal in efficiency of feed utilization up to 16 weeks of age. After this age, the toms continued to grow at about the same rate, while the hens showed a perceptibly slower growth rate.

DAIRY FARMING—DAIRYING

Dairy research in the defense effort (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1941, pp. 117-120).—Included are brief progress reports of studies on the economic limits in the feeding of extra grain to milking cows (coop. 10 State experiment stations), the ovarian-stimulating action of certain young plant materials and the role of pastures in improving the reproductive function of cows, mammary development in young heifers as a basis for predicting future producing ability, the production of vitamin B₂ concentrate from cheese whey, a method for increasing the solids content of evaporated milk without curdling in the heat of sterilization, and the development of processes for making lacquers and resins

from lactic acid suitable as a protective coating for milk cans and other dairy utensils.

[Dairy investigations in Georgia] (*Georgia Sta. Rpt. 1941, pp. 69, 89-90, 98-99*).—Progress reports are presented for the following studies: A comparison of sweetpotato meal and peanuts on the vine as a milk-producing feed for dairy cattle, the effects on growth and development of supplementary concentrate feeding for heifers on summer pasture, and the returns secured from improved dairy pastures.

[Experiments with dairy cattle and dairy products in Wisconsin] (*Wisconsin Sta. Bul. 453 (1941), pp. 12-18, 66-72, figs. 5*).—From a series of studies on the role of vitamins in dairy cattle nutrition by P. Phillips, N. Lundquist, P. Boyer, I. W. Rupel, and H. Lardy, results are noted on the control of calf scours by feeding adequate amounts of vitamins A and B, the vitamin A requirements of calves, the relation of vitamin A intake to the concentration of plasma ascorbic acid and, in turn, to the breeding efficiency of dairy cattle, the value of shark-liver oil as a source of vitamin A for dairy cattle, and the possible role of manganese in the synthesis of vitamin C by animals.

Reports of other nutrition investigations by Rupel, G. Bohstedt, E. B. Hart, M. I. Wegner, A. N. Booth, and C. A. Elvehjem include the utilization of urea as a source of nitrogen by ruminants and the effect of the level of protein in the ration on the utilization of urea, and the synthesis of various members of the vitamin B complex in the alimentary tract of dairy heifers.

From dairy products investigations by F. M. Skelton, H. H. Sommer, J. W. Knechtges, W. Price, and W. Langhus, results are noted on factors affecting the viscosity of cream, the utilization of corn sirup in the manufacture of ice cream, methods of packaging natural cheese, the optimum time for salting brick cheese, and the role of surface microflora in the ripening of brick cheese.

Dairy cattle: Selection, feeding, and management, W. W. YAPP and W. B. NEVENS (*New York: John Wiley & Sons; London: Chapman & Hall, 1941, 3. ed., pp. XVIII+456, pls. [10], figs. 146*).—The third edition of this well-known textbook is noted (E. S. R., 63, p. 889).

Experiments with annual crops and permanent pastures to provide grazing for dairy cows in the Sandhill region of the Southeast, E. W. FAIRES, J. R. DAWSON, J. P. LAMASTER, and G. H. WISE. (Coop. S. C. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 805 (1941), pp. 42, figs. 6*).—Grazing experiments were conducted with dairy cattle over a 5-yr. period on eight 2-acre plats seeded to annual crops to determine the possibility of providing year-round pasturage under conditions prevailing in the Sandhill region. The two major crops were (1) a combination of oats, barley, rye, and vetch for winter and early-spring grazing, and (2) a combination of soybeans and pearl millet for summer and early-fall grazing. Three other crops, included as trial crops, were (1) corn interplanted with velvetbeans for fall grazing, (2) crimson clover and Italian ryegrass for spring grazing, and (3) pearl millet for summer grazing. During the experimental grazing, cattle were rotated from one plat to another as frequently as was considered necessary to obtain optimum yields. In conjunction with the annual grazing crops, records were kept on the cost and carrying capacity of a permanent pasture established on similar land. Yields of all crops were established by harvesting representative protected areas as well as by grazing.

The yields, and distribution of the yields, varied widely from year to year, depending largely on the amount and distribution of rainfall. The combination of oats, barley, rye, and vetch, the pearl millet, and the corn and velvetbeans produced the best results in terms of total yields and distribution

of yields. The average number of grazing days per season and the estimated cost per 100 lb. of total digestible nutrients were—permanent pasture 152 days and 82 ct.; pearl millet 109 and \$1.18; soybeans and pearl millet 114 and \$1.93; oats, barley, rye, and vetch 99 and \$3.28; Italian ryegrass and crimson clover 24 and \$6.55; and corn stover and velvetbeans 70 days and \$1.77.

Die Einsäuerung jungen, eiweissreichen Grünfutters mit Trockenmolke [Ensiling young protein-rich green fodder with dried whey], G. RUSCHMANN and H. BARTRAM (*Zentbl. Bakt. [etc.]*, 2. Abt., 103 (1941), No. 12-14, pp. 193-224, figs. 7).—Dried whey was added to green alfalfa and to a grass mixture at rates of 0, 1.68, 3.36, and 5.04 percent at the time of ensiling. Extensive data are presented on the chemical and bacteriological properties of the resulting silages. The optimum level of dried whey as a preservative appeared to fall between 2 and 3 percent. The importance of the microflora of the dried whey in affecting the fermentation process in the silage is stressed. A comparison of dried whey and pure lactose as preservatives indicated that compounds in whey other than the milk sugar exerted a beneficial effect on the silage. The buffer properties of the silage apparently were improved by the proteins and minerals contained in the dried whey.

Studies on the secretion of milk fat.—III, The effect of thyroxine administration on the blood lipoids and on the nature of the milk fat, J. A. B. SMITH and N. N. DASTUR (*Biochem. Jour.*, 34 (1940), No. 7, pp. 1093-1107, figs. 6).—Continuing this series (*E. S. R.*, 81, p. 267), thyroxine was administered by intramuscular injection to four lactating cows at the rate of 10 mg. daily over 10- to 15-day experimental periods. Yields of milk and fat were markedly increased during the injection period, but no consistent changes in the level of nonfatty solids in the milk occurred other than a slight decrease in protein concentration. Also, the nature of the milk fat was not significantly altered except for a slight temporary change at the beginning of the hyperthyroid period. The concentration of plasma sugar was increased from 10 to 26 percent, accompanied by a decrease of from 10 to 20 percent in the concentration of the main lipid constituents in the plasma during the injection period. The relationship between the plasma lipoids and yield of milk fat is briefly discussed.

Secretion of orally administered radio-iron in the milk of cows, L. A. ERF. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 284-287).—Immediately after complete milking, two cows (one Holstein and one Jersey) were drenched with 155 cc. of iron chloride solution, each cubic centimeter of which contained 4 mg. of FeCl_3 (radio-iron). Six hr. later both cows were milked and bled, and milking occurred twice daily thereafter for 3 days. The milk secreted by the Holstein and Jersey, respectively, over the 78-hr. period contained 0.121 and 0.128 percent of radio-iron per liter, equivalent to 1.5 and 2.5 percent of the orally administered iron.

Observations on the serum phosphatase of cattle and sheep, W. M. ALLCROFT and S. J. FOLLEY (*Biochem. Jour.*, 35 (1941), No. 3, pp. 254-266).—Phosphatase values as determined in 367 blood samples from dairy cows, 119 from beef cattle, and 555 from ewes are summarized. In apparently normal animals these serum phosphatase values ranged from 0.3 to 114.3 and 3.0 to 166.1 units per 100 cc., with 71.2 and 53.3 percent containing less than 15 units and 90.7 and 91.7 percent less than 40 units for cows and ewes, respectively. In view of these wide fluctuations it is concluded that serum phosphatase determination can be of little diagnostic value. Despite wide differences between animals, the general level of an individual tended to remain rather constant over long periods. In both cattle and sheep, serum phosphatase

values progressively decreased with advancing age to maturity and was relatively stable thereafter. There is some evidence that pregnancy per se is accompanied by a slightly raised serum phosphatase in dairy cows, though the level of phosphatase does not appear to be correlated with the stage of pregnancy. No evidence was found of correlation between milking capacity and serum phosphatase activity in dairy cows. The high phosphatase activity of the sera of some clinically healthy cows does not appear to be due to an enzyme activator in these sera.

Growth response of thyroidectomized goats to artificially formed thyroprotein, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 5, pp. 667-673, figs. 2).—Following an operative technic as described, a number of goat kids were thyroidectomized during the first month of life. Approximately 1 mo. later, after symptoms of thyroid deficiency had developed, three pairs of the thyroidectomized kids, respectively, received orally 0.3, 0.5, and 1.0 gm. per head daily of thyrolactin—iodinated skim milk protein (E. S. R., 83, p. 608). This treatment arrested the development of cretinism and stimulated growth approaching that of the normal. Growth rate was roughly proportional to the amount of thyroprotein given within the range covered. It is concluded that the thyroprotein had a physiologic activity fully comparable to thyroid substance. The possible utilization of thyroprotein in animal production is discussed.

Quantitative study of the effect of inanition on responsiveness of the mammary gland to estrogen, J. J. TRENTIN and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 29 (1941), No. 6, pp. 984-989, fig. 1).—Groups of male albino mice, weighing from 15 to 20 gm. each, were fed at five levels of feed intake, i. e., 1.5, 2, 2.5, and 3 gm. and unlimited amounts per mouse daily. Oestrogen (oestradiol benzoate) was administered to members of the different groups in amounts ranging from 1 to 32 Lewis units (E. S. R., 82, p. 322). It was found that as the food intake level decreased the amount of oestradiol benzoate required to produce a minimum duct growth response of the mammary gland was greatly and proportionately increased.

The assay of prolactin by means of the pigeon crop-gland response, S. J. FOLLEY, F. J. DYER, and K. H. COWARD (*Jour. Endocrinol.*, 2 (1940), No. 2, pp. 179-193, figs. 6).—A summary of experiences with the crop-weight method for prolactin assays with pigeons showed that for assay of prolactin there should be from 15 to 20 pigeons between 260 and 360 gm. in live weight for each range in dose. The temperature should be maintained at 15° C. and results calculated on the basis of live weight. The relation between crop weight or ratio of crop weight to live weight and dose of hormone was best exhibited by a sigmoid curve.

Further experiments on the continued treatment of lactating cows with anterior pituitary extracts, S. J. FOLLEY and F. G. YOUNG (*Jour. Endocrinol.*, 2 (1940), No. 2, pp. 226-236, fig. 1).—Continuing this line of investigation (E. S. R., 80, p. 473; 83, p. 100), four groups of four cows each, all in declining stage of lactation, respectively, received repeated injections over 22 days of (1) inert protein in the form of thymus extract, (2) crude alkaline pituitary extract, (3) concentrated prolactin preparation, and (4) glycotropic preparation. The crude pituitary extract increased the average daily milk production during the experimental period to an average of 16 percent above the expected level, whereas the prolactin preparation, which was seven times as potent as the crude extract in pigeon crop-gland-stimulating activity, increased the milk yield only 5 percent above that expected. The glycotropic preparation had no apparent effect on production. None of the treatments involving pituitary

extract affected the fat content or nonfatty solids in the milk. The significance of these results with respect to a belief in the existence of a single milk-stimulating hormone secreted by the anterior pituitary gland is discussed.

An analysis of the relationship between the curd tension and the curd surface area of milk, A. B. STORRS (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 1041-1046).—Continuing this line of investigation (*E. S. R.*, 86, p. 378), curd tension and curd surface area were determined on sublots of untreated whole milk, homogenized milk, enzyme-treated milk, and base exchange milk, each adjusted to a pH of 4.0, 4.5, 5.0, 5.5, and 6.0. The coefficients of correlation between curd tension and curd surface area varied considerably, showing both positive and negative correlations, but in no instance were they of sufficient magnitude to be considered significant. It is concluded that curd tension and curd surface area are independent characteristics of milk and that each may be influenced or determined by factors not closely related.

Studies on soft curd milk prepared by the enzyme treatment method, A. W. TURNER. (Univ. Ill. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 593-595).—Enzyme treatment in these investigations consisted in adding 1 part of pancreatic concentrate of high tryptic value to 10,000-15,000 parts of cold raw milk, followed by pasteurization in the usual manner. From *in vitro* digestion experiments it was found that enzyme-milk filtrates contained an average of 18.1 percent more protein than normal milk filtrates. The enzyme-treated milk contained considerably more alcohol-soluble protein and proteose peptone nitrogen but only slightly more amino acid nitrogen than normal pasteurized milk. Casein prepared from enzyme-treated skim milk was more soluble in 70 percent alcohol than that prepared from pasteurized milk.

Die Aromabildung bei der Rahmsäuerung [The development of aroma in the ripening of cream], A. I. VIRTANEN, P. KONTIO, and T. STORGARDS (*Biochem. Ztschr.*, 307 (1941), No. 3, pp. 215-219).—To test the theory that acetylmethylcarbinol is formed from citric acid during the ripening of cream by aroma-producing bacteria, pure cultures of these organisms were grown on various media. Acetylmethylcarbinol was produced from glucose in the presence of methylene blue or quinone, but not in the absence of a suitable hydrogen acceptor. It was not formed from citric acid, even in the presence of methylene blue. Apparently sugar and not citric acid is the essential material in aroma development.

What you can do with colloidal stabilizers, W. C. COLE. (Univ. Calif.). (*Food Indus.*, 13 (1941), Nos. 9, pp. 44-48, figs. 3; 10, pp. 57-59, figs. 2).—The relation of colloidal stabilizers in food processing is discussed, with particular reference to those that stabilize (1) emulsions, (2) suspensions, (3) foams, (4) jellies as a result of gelation, and (5) the texture of frozen products such as ice cream and other frozen foods by retarding or preventing the growth of ice crystals. The necessity of selecting stabilizers particularly adapted to the system requiring stabilization and regulation of the processing to secure the desired results is stressed. A bibliography of 22 references is included.

The whence and whither of milk sanitation, R. S. BREED. (N. Y. State Expt. Sta.). (*Canad. Pub. Health Jour.*, 31 (1940), No. 9, pp. 414-423).—An interesting history of the development of the milk sanitation movement from 1880 to the present.

The lethal effectiveness of ultra violet rays applied to milk, G. C. SUPPLEE, G. E. FLANIGAN, and O. G. JENSEN (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 1055-1070, figs. 10).—Various sources of ultraviolet radiation supplied by mercury arcs and both standard and special lamps were applied to both flowing and stationary films of milk in the series of tests described. Bacterial plate counts

on milk were made with tryptone glucose agar incubated at 37° C. The bactericidal effect from such radiation was greater when applied to a smooth-flowing milk film than to films flowing over a corrugated cooler surface. Also, the lethal radiation was relatively more effective per unit volume of milk when applied to flowing films than when applied to stationary films having a thickness of an adhesion layer only. The spectral characteristics of the radiation as well as the intensity greatly influenced its lethal effectiveness. Radiation predominantly in the 2,200 to 2,300 Å. region gave erratic bactericidal results, and in some cases sublethal doses appeared to cause stimulation. The total lethal effect of radiation and elevated temperatures when applied simultaneously for less than 1 sec. appeared to be an additive process. By applying ultraviolet radiation of appropriate intensity and spectral characteristics, at least 90 percent and frequently from 95 to 98 percent of the bacteria of raw milk could be regularly destroyed.

"Quick-time" pasteurization of milk, A. C. DAHLBERG, R. F. HOLLAND, and R. K. MINER (*New York State Sta. Tech. Bul.* 261 (1941), pp. 15).—Supplementing earlier laboratory trials (E. S. R., 84, p. 809), experiments were conducted on short-time high-temperature pasteurization of milk under controlled factory conditions. The pasteurizing equipment consisted of a section of 12 internal tubes 1.5 in. in diameter by 10 ft. in length. Preheating occurred in the first three tubes, maximum heating was reached in the fourth and fifth, and gradual cooling occurred in the remaining seven tubes. Milk was successfully quick-time pasteurized at 169° to 177.5° F., with a time interval above 140° ranging from 5 to 24 sec. At these higher temperatures the variation in the highest temperature attained could be greater than the present expected pasteurization standards and still show proper pasteurization. In general, milk subjected to quick-time pasteurization was slightly superior in quality to that pasteurized by the conventional vat-holder method.

Detergents in the dairy industry, C. SCHWARTZ (*Jour. Milk Technol.*, 4 (1941), No. 5, pp. 258-267, figs. 2).—This is a general discussion of the dairy equipment cleaning problem, with a classification of detergents and suggestions regarding the selection and use of a detergent best adapted to a particular job. As a general conclusion, it is stated that the best detergent available to the dairy industry today is one in which there is contained an efficient calcium-sequestering material for the control or prevention of alkaline-earth-metal precipitates, and an alkali sufficient in amount to do a good cleaning job and of a type least harmful both to operator and equipment.

Factors affecting the gas content of milk, C. I. NOLL and G. C. SUPPLEE (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 993-1013, figs. 3).—Based on the analyses of 63 mixed raw milk samples as received at commercial milk plants, average gas contents were—oxygen 0.47 percent, nitrogen 1.29, and carbon dioxide 4.45 percent. The oxygen content of hot milk under short-time, high-temperature pasteurization was reduced approximately 50 percent, but substantial amounts of oxygen were reabsorbed during subsequent cooling, the final amount surpassing the prepasteurization level in some cases when a large surface per unit volume was exposed to air during cooling. The flushing of milk with air under 25-in. vacuum, with nitrogen at atmospheric pressure, and with either nitrogen or carbon dioxide under vacuum were all highly effective in removing oxygen from milk. The efficiency of any of the systems increased as milk temperatures were increased. It is shown that the effects of temperature and pressure on the gas content of milk followed the well-known physical laws governing the solubility of gases in liquids. Ascorbic acid proved to be very reactive, consuming oxygen dissolved in milk. It could be employed as a means of deoxygenating milk,

and conversely its stability or preservation was dependent upon the absence of dissolved oxygen in milk. In the absence of dissolved oxygen, ascorbic acid in milk proved stable to intense light, to the oxidizing effect of copper salts, and to high temperature.

Oxidized flavor in milk.—X, The effect of feeding potassium iodide supplements to dairy cows on the carotene content of the butter fat and on the ascorbic acid content of the milk and the relationship to metal-induced oxidized flavor, W. C. BROWN, A. H. VANLANDINGHAM, and C. E. WEAKLEY, JR. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 1035-1039, figs. 2).—Continuing this series (E. S. R., 86, p. 523), five Jersey cows received, in addition to the regular herd ration, 5 gm. daily of potassium iodide over a 14-day period. Milk produced during that period was markedly lower in ascorbic acid content but essentially unchanged in carotene content or susceptibility to copper-induced oxidized flavor development as compared with milk produced during the 4 weeks preceding and the 2 weeks following the period of supplemental feeding. It is concluded that the level of the ascorbic acid in milk may not be so great a factor in determining susceptibility to oxidized flavor development as was formerly believed.

Studies on the antioxygenic effect of oat flour treated milk bottles for milk exposed to sunlight, C. W. ENGLAND and A. P. WIEDEMER. (Md. Expt. Sta.). (*Milk Dealer*, 31 (1941), No. 3, pp. 33-34, 36, fig. 1).—Mixed herd milk, handled without contact with copper but known to be susceptible to spontaneous oxidation, was used throughout the series of trials. Identical lots of pasteurized cooled milk were bottled in plain glass bottles, untreated paper bottles, and treated paper bottles (the treatment consisting of sizing cardboard with finely milled oat flour prior to fabrication and paraffining). Sublots of each were exposed at 40° and 70° F. to morning, midday, and afternoon sun for 10, 20, and 40 min., then held in the dark at 40°, and judged for flavor after 12, 24, and 48 hr.

In all cases intensity of oxidized flavor increased with increasing length of exposure, and this defect was more intense after exposure at 70° than at 40°. Midday sun activated greater intensity of off-flavor in glass bottles, while morning sunlight had greater effect on milk in paper bottles. Under like conditions, paper bottles afforded more protection to milk than glass bottles. The treated paper bottles afforded some protection to milk against oxidized flavor when the period of exposure to sunlight exceeded 10 min.

Microbiology of paper containers, J. R. SANBORN. (N. Y. State Expt. Sta.). (*Mod. Packaging*, 14 (1941), No. 12, pp. 46-47, 106).—In addition to a general discussion of this problem, data resulting from the bacterial analyses of several thousand liquid-tight paper containers, including milk containers, are summarized. A high percentage of these yielded less than 5 colonies per container, and very few exceeded 100 per container, which indicates the high quality of paper stock and the sanitary protection afforded the stock during fabrication of such containers.

Observations on the composition of Cheddar cheeses, J. C. MARQUARDT and M. W. YALE. (N. Y. State Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 32 (1941), No. 12, pp. 16-18, 20, 22, 24).—Supplementing an earlier report on this subject (E. S. R., 84, p. 242), data are presented on the salt and moisture contents of various types of Cheddar cheese entered in competition at the 1941 New York State fair. Average values for salt and moisture, respectively, were export Cheddar 1.34 and 37.2, home-trade Cheddar 1.4 and 37.4, sage 1.37 and 37.45, young America 1.37 and 38, pimiento and miscellaneous 1.44 and 39.8, and picnic twins 1.39 and 37.8. Salt content was extremely variable, the

spread between minimum and maximum values exceeding 1 percent in three of the types studied. The spread between minimum and maximum moisture values varied from 4.5 percent in pimiento and miscellaneous types to 8 percent in export Cheddars. The average moisture content of all cheeses was over 2 percent below the legal requirements. Fat analyses revealed that about 50 percent contained less than 30 percent of fat, a percentage below which quality is adversely affected. About 30 percent contained over 32 percent fat, and the remainder contained from 30 to 32 percent fat.

A new method for making cheese, C. C. FLORA. (Va. A. and M. Col.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 1, p. 16).—The significant feature of the described method is the addition of water to the cheese batch, at the time of cutting the curd, which will lower the acid content of the whey to near 0.12 percent. Otherwise standard methods are followed. It is claimed that in this manner good marketable cheese can be made from milk of low, medium, or high percentage acidity.

The bacteriology of brick cheese.—I, Growth and activity of starter bacteria during manufacture, J. C. GAREY, E. M. FOSTER, and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 12, pp. 1015-1025).—Using a conventional method for the manufacture of brick cheese, experimental lots were prepared using (1) a pure *Streptococcus lactis* starter, (2) a pure *S. thermophilus* starter, and (3) a mixture of the two starter cultures. It was observed during the manufacturing process that *S. thermophilus* practically stopped growth at the third or fourth hour after dipping because of low temperature, whereas the activity of *S. lactis* was not extensive until the latter part of the draining period, and maximum numbers of these organisms were usually reached within 1 or 2 days. At a cooking temperature above 106° F. growth and activity of *S. lactis* was greatly retarded, while a temperature of 112° increased the rate of growth and activity of *S. thermophilus*. When *S. lactis* was the only starter a sour flavor and weak or crumbly body often developed unless special care was taken to control the moisture at dipping. These defects developed if the moisture content at 2 days was higher than 42 percent. A fermented flavor and open texture developed in the cheese with *S. thermophilus* as the only starter. A combination of the two starters gave a better quality cheese than when either was used alone.

Study of New York State Limburger shows quality improvement in 1941, M. W. YALE and J. C. MARQUARDT. (N. Y. State Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 1, p. 57).—The score and the salt, moisture, and fat contents of 25 lots of Limburger cheese entered in competition at the 1941 New York State Fair are presented. Bitterness, the most common flavor defect, was noted in 8 of the samples. This condition appeared to be rather definitely correlated with low salt content.

Italian cheese varieties, J. C. MARQUARDT. (N. Y. State Expt. Sta.) (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 1, pp. 10-11, 36, 38-39, fig. 1).—Based on direct translations from the Italian, information is presented on the distinguishing characteristics and method of manufacture of Caciocavallo, Provolone, Provole, and Pecorino Romano types of cheese. The procedures determined at this station for preparing American Provolone-type and Romano-type cheeses are included.

VETERINARY MEDICINE

[Investigations in diseases of livestock] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1941, pp. 211-215).—Reference is made to the control of diseases of horses; effectiveness of phenothiazine against internal parasites; added protection to

the swine industry by closer supervision over the distribution of anti-hog-cholera serum, hog-cholera virus, and similar biological products; suppression of Bang's disease; bovine tuberculosis campaign reaches goal; Federal meat inspection; and livestock quarantines.

[Work in animal pathology and parasitology by the Wisconsin Station]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul.* 453 (1941), pp. 4-10, 23, 61, 62, figs. 3).—Reports of work (E. S. R., 84, p. 668) by S. H. Waxler, C. A. Herrick, C. E. Holmes, D. L. DeGiusti, G. L. Ott, A. I. Coombes, W. Wisnicky, E. H. Spitzer, C. H. Winkler, B. B. Morgan, F. B. Hadley, W. D. Pouden, B. A. Beach, E. G. Hastings, J. R. Wagner, C. A. Elvehjem, J. McCarter, and D. Watson relate to the vaccination of chicks for coccidiosis, experiments with steamed bonemeal and with organic sulfur compounds for control of coccidiosis, rickets in foxes due to unbalanced mineral supplements, Chastek paralysis of foxes a vitamin B₁ deficiency, vitamin A for foxes, deworming of sheep, internal parasites commonly found in horses, mastitis control, relation of wheat gluten to running fits in dogs, and use of low-potency tuberculins.

[Contributions on animal parasitology] (*Jour. Parasitol.*, 27 (1941), No. 6, Sup., pp. 14, 16-23, 24-25, 26, 27, 28-29, 30-31, 35-36, 37, 38).—Among the contributions presented at the annual meeting of the American Society of Parasitologists held in Dallas, Tex., in December 1941 (E. S. R., 86, p. 383), abstracts of which are given, are: The Occurrence of *Dicrocoelium dendriticum* in the United States, by E. W. Price and W. D. Kinchelov (p. 14), The Effects of Sulfaguanidine on Experimental Bovine Coccidiosis, by D. C. Boughton (pp. 16-17), Some Clinical Aspects of Experimental Esophagostomiasis in Cattle, by J. S. Andrews (pp. 17-18), The Biology and Ecology of the Snail (*Stagnicola bulimoides techella* (Hald.)), Intermediate Host of *Fasciola hepatica* Linn., in South Texas, by O. W. Olsen (p. 18), The Effect of Milk Diet on the Development of *Haemonchus contortus* in Calves, by D. A. Porter (pp. 18-19), Sulfaguanidine Feeding as a Control Measure for Cecal Coccidiosis of Chickens, by M. M. Farr and R. W. Allen (p. 20), Effect of a Single Dose of Phenothiazine Upon Egg Production and Viability of the Eggs of Swine Lungworms, by L. A. Spindler and K. C. Kates (p. 20), Skin and Precipitin Tests for the Diagnosis of *Trichina* Infections in Grain-Fed and in Garbage-Fed Hogs, by L. A. Spindler and J. L. Avery (p. 21), Reactions in Garbage-Fed and in Grain-Fed Hogs to Intracutaneous Injections of Various Diluents, by J. L. Avery (p. 21), Precipitate Formation Around *Trichina* Larvae in Sera From *Trichina*-Infected and *Trichina*-Free Hogs, by L. A. Spindler, J. L. Avery, and H. E. Zimmerman, Jr. (p. 22), and Experimental Infection of Pigs With the Swine Thorn-Headed Worm *Macracanthorhynchus hirudinaceus*, by K. C. Kates (p. 22) (all U. S. D. A.); The Incidence of *Trichomonas foetus* in Wisconsin Cattle, by B. B. Morgan (p. 16), and Immunization Against Coccidiosis by the Use of X-ray Attenuated Oöcysts, by S. H. Waxler and C. A. Herrick (p. 17) (both Univ. Wis.); Hatching Ascaris Eggs in Vitro, by G. L. Graham (p. 17); Losses of *Haemonchus* Larvae Early After Their Administration in Susceptible Sheep, by N. R. Stoll and J. H. Tetley (p. 18); Studies on Bovine Gastro-Intestinal Parasites—VII, The Effects of a Low Plane of Nutrition (Cottonseed Hulls) on Immunity to the Stomach Worm *Haemonchus contortus*, by R. L. Mayhew (p. 19) (E. S. R., 86, p. 383), and Further Data on the Blood Picture in Stomach Worm *Haemonchus contortus* Infections, by E. T. Delaune and R. L. Mayhew (p. 19) (both La. State Univ.); Notes on the Musculature of the Male Genitalia of *Haemonchus contortus*, by W. L. Threlkeld and M. E. Henderson (pp. 19-20) (Va. Expt. Sta.); Limited Tests of Phenothiazine as an Anthelmintic in Goats, by P. D. Harwood and J. E. Guthrie (pp. 20-21); The Duration of Infectivity of Nematode Parasites of Cattle on Florida Pasture With Observations on Re-

sistance of Calves to Natural Re-infection With *Haemonchus contortus*, by D. A. Porter, L. E. Swanson, and T. J. Drake (pp. 22-23) (U. S. D. A. and Univ. Fla.); The Effect of Host Age on the Number of *Trichinella spiralis* Recovered From Rats During the Early Period of Infection, by L. O. Nolf and H. Zaiman (p. 24); The Effects of Immune Serum Upon the Larvae of *Trichinella spiralis* in Vitro, by E. P. Offutt, Jr. (p. 24); Attempted Passive Transfer to Rats and Mice of Immunity to *Trichinella spiralis*, by O. R. McCoy and F. F. Bond (pp. 24-25); The Protective Action of Normal Sheep Serum Against Infections of *Trypanosoma duttoni* in the Mouse, by W. H. Taliaferro and Y. P. Olsen (p. 25); The Trypanocidal Action of Sheep Serum on *Trypanosoma duttoni*, by W. H. and L. G. Taliaferro (p. 25); Quantitative Relationships in Immunity to Hookworm, by G. F. Otto (p. 25); *Hexamita* [muris?] in the Blood of a Mouse, by J. Andrews and M. Reynolds (p. 26); Some observations on *Histomonas* From Wild Pheasants and Domestic Fowls, by D. H. Wenrich (pp. 27-28); Pantothenic Acid and *Eimeria nieschulzi* Infection in the White Rat, by E. R. Becker (p. 28) (Iowa State Col.); Transmission of the Liver Coccidium *Eimeria stiedae* From the Domestic to the Cottontail Rabbit, by H. A. Jankiewicz (p. 28); Life Cycles of Four Species of Intestinal Coccidia of the Domestic Rabbit, by R. L. Rutherford and J. F. Kessel (pp. 28-29); The Occurrence of *Heterodoxus longitarsus* Piaget (Mallophaga: Boopinae) on Dogs in Mississippi, by J. W. Ward (p. 30) (Miss. State Col.); Mechanical Transmission of Shope Rabbit Fibroma by Certain Haematophagous Bugs, by C. B. Philip (pp. 30-31); Removal of Chicken Tapeworms by Host Starvation and Some Effects of Such Treatment on Tapeworm Metabolism, by W. M. Reid and J. E. Ackert (p. 35) (Kans. State Col. et al); The Life Cycle of *Diocotophyme renale*, the Giant Kidney Worm of Mammals, by A. E. Woodhead (pp. 35-36); The Possibility of Chemical Control of the Snail Intermediate Hosts of *Schistosoma mansoni* in Venezuela, by G. W. Luttermoser (p. 36); Effects of Duodenal Mucus of Dogs and Swine Upon the Viability of *Ascaridia lineata* in Vitro, by L. L. Eisenbrandt and J. E. Ackert (p. 36) (Kans. State Col. et al.); Intestinal Resistance to a Second Infection of *Trichinella spiralis*, by A. J. Levin and T. C. Evans (p. 37); and Cultivation Experiments With the Avian Malaria *Plasmodium circumflexum*, by F. Coulston (p. 38).

Isolation of Coccidioides from soil and rodents, C. W. EMMONS (Pub. Health Rpts. [U. S.], 57 (1942), No. 4, pp. 109-111).—In the search in Arizona for an animal reservoir of the fungus parasite *C. immitis*, the cause of coccidioidomycosis which occurs sporadically in cattle, sheep, and dogs as an accidental infection, as in man, 105 wild rodents were examined. This fungus was found present upon direct examination or by culture in 25 of these animals, representing 6 species, namely, *Peromyscus eremicus*, *Perognathus baileyi*, *P. penicillatus*, *P. intermedius*, *Dipodomys merriami*, and *Citellus harrisi*. Species of the genus *Perognathus* appear to be especially important hosts, as 21 of 26 specimens had fungus infections. In the San Carlos area of Arizona the fungus has been isolated from the soil and from rodents but not as yet from a human case of the disease. Small rodents appear to constitute an important natural reservoir of *Coccidioides*. This may explain, on the one hand, the presence of the spores of the fungus in wind-blown soil contaminated by infected animals and, on the other hand, the difficulty of isolating the fungus from soil in which it has a highly localized and spotty distribution.

Manuel de classification et de détermination des bactéries anaérobies [Manual for the classification and determination of the anaerobe bacteria], A. R. PRÉVOT (Paris: Masson & Co., 1940, pp. [1]+223).—This work consists largely of systematic descriptions of the anaerobe bacteria, each presented in a concise, uniform way.

New and nonofficial remedies, 1941 (*Chicago: Amer. Med. Assoc., [1941], pp. 691+LXX; sup., pp. 30, rev. sup., pp. 53*).

Sulfapyridine therapy in local infections, A. H. BRYAN (*Jour. Amer. Vet. Med. Assoc., 100 (1942), No. 778, pp. 73-75*).

A therapeutic incompatibility between sulfapyridine and quinine, B. K. HARNED and V. V. COLE (*Jour. Pharmacol. and Expt. Ther., 74 (1942), No. 1, pp. 42-51, figs. 3*).—In the experimental work reported, quinine administered orally with sulfapyridine to rats increased the total amount of sulfapyridine absorbed and excreted in the urine. "The maximal increase was produced by the largest dose of quinine and, using average values, amounted to 44 percent. The increase in the urinary excretion of total sulfapyridine represented principally an increase in the acetylsulfapyridine. The largest dose of quinine produced an average increase of 96 percent in the excretion of acetylsulfapyridine. This effect was not accompanied by an increase in the volume of urine. Quinine depressed the free sulfapyridine in the urine. The maximal decrease observed was 33 percent. Atabrine substituted for quinine produced no comparable effect."

An in vitro study on the synergistic action of sulfamido compounds and azochloramid upon various pathogenic microorganisms, E. NETER (*Jour. Pharmacol. and Expt. Ther., 74 (1942), No. 1, pp. 52-60*).—It was revealed in an in vitro study on the combined antibacterial activity of sulfamido compounds and azochloramide that "(1) azochloramide used in combination with sulfanilamide, sulfathiazole, and sulfadiazine may exert greater bacteriostatic activity toward group A hemolytic streptococcus than does either compound alone in like or somewhat higher concentrations; (2) a slight increase in bacteriostatic activity toward group D hemolytic streptococcus was obtained when azochloramide was used in conjunction with sulfanilamide; (3) the combined use of azochloramide and sulfanilamide, sulfapyridine, sulfathiazole, or sulfadiazine resulted in greater inhibition of growth of pneumococcus type I than did that of either drug alone in like or somewhat higher concentrations; [and] (4) the combined use of sulfathiazole or sulfadiazine and azochloramide retarded the growth of *Staphylococcus aureus hemolyticus* to a greater extent than did either drug in like or higher concentrations."

Conjugation of sulfanilamide by a pathological tissue in vitro, A. GOTH (*Jour. Pharmacol. and Expt. Ther., 74 (1942), No. 1, pp. 71-74*).—It was found that the fowl pox lesion is able to conjugate sulfanilamide in vitro. The relationship between this conjugating capacity and the glucose-splitting power of the fowl pox lesion is considered.

Binding of sulfonamides by plasma proteins, B. D. DAVIS (*Science, 95 (1942), No. 2455, p. 78*).

Some toxicological and pharmacological properties of gramicidin, tyrocidine, and tyrothricin, H. J. ROBINSON and H. MOLITOR (*Jour. Pharmacol. and Expt. Ther., 74 (1942), No. 1, pp. 75-82, figs. 3*).—In the work reported the acute, peroral, intraperitoneal, and intravenous toxicity of tyrothricin, gramicidin, and tyrocidine was determined in 1,200 Swiss mice and 210 albino rats. None of these compounds was toxic when given by mouth, but upon parenteral administration all proved definitely toxic, gramicidin and tyrothricin considerably more so than tyrocidine. "Daily parenteral administration of 2 mg. of gramicidin or tyrothricin per kilogram to dogs caused death within 2-8 days. During this period the dogs lost their appetite and weight and secreted excessive amounts of saliva. Their red blood counts dropped in some cases from 6,000,000 to 3,500,000 per cubic millimeter. In isolated organs as well as in situ, tyrocidine produced greater pharmacological changes than tyrothricin or gramicidin, possibly due to its greater solubility in water. None of the drugs has a pro-

nounced specific effect on the respiratory or circulatory system. Large single doses are usually tolerated without any marked effect, while repeated administrations even of small doses cause a fall of blood pressure and impairment of respiration. With lethal doses the respiration stops shortly before the heart. Concentrations of gramicidin suspensions up to 0.5 percent are not irritating upon instillation into the conjunctival sacs of rabbits. However, application of the dried material produces marked conjunctival irritation and a long-persisting opaqueness of the cornea. When injected subcutaneously or intradermally the preparations remain unabsorbed for a long period of time."

Human encephalitis due to the virus of equine encephalomyelitis, C. M. EKLUND (*Vet. Med.*, 37 (1942), No. 2, pp. 70-76).—This summary of the present status of knowledge of the subject is presented with a list of 36 references to the literature.

Hemorrhagic septicemia in mule deer, E. R. QUORTRUP (*North Amer. Vet.*, 23 (1942), No. 1, pp. 34-36, figs. 2).—An outbreak of a disease among mule deer on the Stansbury Range in Tooele County, Utah, investigated in the fall of 1940, was diagnosed through post-mortem and bacteriological examinations and animal inoculation as due to *Pasteurella bovisepctica*. In an examination of 50 miles of range made on September 4 and 5, 59 dead deer were found, but no sick deer were observed, indicating that the losses had occurred through the month of August, with the peak probably about the middle of the month. In the course of laboratory work a pure culture was obtained through guinea pig inoculation from deer lung tissue which had been frozen in the ice box for as long as 3 weeks.

Cattle were observed grazing on the same range used by the deer, but none was found or reported afflicted. In order to prevent infective organisms being carried downstream to the range of healthy animals below, all carcasses in and near streams were removed and incinerated by the Forest Service and State Game Department officials.

No abnormal losses were observed during the 1941 hunting season, and the deer appeared to be as plentiful on the range as usual.

Rabies (*Union So. Africa Dept. Agr. and Forestry Bul.* 214 (1941), pp. 31, figs. 9).—A practical summary of information.

Bovine tuberculosis eradication in the United States and its resulting beneficial effects on human health, J. A. MYERS. (Univ. Minn.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 12-18).

Tuberculosis in the buffalo, S. HADWEN (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 19-22, figs. 3).—This discussion relates to a herd of tubercular buffaloes maintained in Canada for more than 26 yr. The disease did not interfere with the growth of the herd, which made considerable gains. There was no contact with animals other than members of the deer family, which with the exception of the mule deer readily acquired tuberculosis from the buffaloes.

Further studies on the significance of suspicious agglutination reactions for Bang's disease, C. P. FITCH, W. L. BOYD, M. D. KELLY, and L. M. BISHOP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 23-26).—Studies in continuation of the earlier work noted (*E. S. R.*, 77, p. 698) are reported, which extended over a period of 12 yr., nearly all of the animals being observed for a period including at least one calving. Bacteriologic examinations were made of the milk, colostrum, placentas, vaginal discharges, fetuses, and calves which died shortly after birth to determine whether the animals were excreting *Brucella abortus*. Agglutination titers of the blood and milk were determined at regular intervals. Negative control animals were

housed with suspect animals in each barn and were allowed in the same paddocks. All animals were isolated at the time of parturition. *B. abortus* was isolated from two animals with suspicious agglutination titers and from two of the controls. The isolation of *B. abortus* from 9 of 97 animals which entered the experimental herd with titers complete at 1:100 or incomplete at 1:100 suggests that these animals may be a sufficiently dangerous source of infection to warrant their removal from a herd.

A clinical survey of intoxications of cattle by Sudan grass (*Sorghum sudanense*), A. L. ROSE (*Austral. Vet. Jour.*, 17 (1941), No. 6, pp. 211-219).—Account is given of a number of serious losses from Sudan grass poisoning supported by a tabulated statement of the principal data as evidence that pure Sudan grass may be just as toxic as are its hybrids with sorghum. The seasonal conditions which predispose to intoxications are those in which rain falls during the heat of the summer, inducing optimum growth of the plant. Sudan grass which has been eaten to the ground by grasshoppers and which is regrowing rapidly after rain has proved, in almost all cases, to be at the dangerous stage. A few mortalities on other sorghum species such as amercane, Johnson grass, and broom millet are also recorded. Particulars are given of what appears to be a specific line of treatment, especially if adopted along with symptomatic treatment. It is concluded that none of the *Sorghum* spp. is safe to feed off to cattle at any stage of growth.

[Work with sheep parasites by the Georgia Station] (*Georgia Sta. Rpt. 1941*, pp. 77-78).—The work of the year (E. S. R., 84, p. 105) relates to worm control in sheep and control of the sheep tick and the sheep louse *Trichodectes ovis*.

The incidence of coccidia and intestinal nematodes in sheep at the Utah State Agricultural College and vicinity of Logan, D. M. HAMMOND and G. A. HAMILTON. (Utah State Agr. Col.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 18 (1940-41), pp. 69-71).—All of 67 sheep that were given fecal examinations proved to be infected with coccidia. The incidence of species as determined by the unsporulated oocyst was similar in general to that found by Christensen (E. S. R., 80, p. 396) in sheep from Idaho, Wyoming, Maryland, and New York. Sheep at the college kept in clean pens throughout the year and fed from feed racks were found to have a significantly lower rate of infestation with intestinal nematodes than Karakul sheep kept in pastures or in small enclosures and fed on the ground.

A skin disease of sheep due to an ectoparasitic mite, *Psorergates ovis* Womersley 1941, H. B. CARTER (*Austral. Vet. Jour.*, 17 (1941), No. 6, pp. 193-201, pls. 2, figs. 6).—Description is given of the disease and of the mite *P. ovis* which is responsible for a chronic irritation of the skin and much damage to the fleece. The principal lesions produced are a hyperkeratosis of the skin, with an excessive amount of dry, crumbling scurf. The staple becomes stringy with a tip which is dry and spiral-pointed, and its tensile strength may be seriously reduced. Some degree of coting may occur in the fleece of advanced cases. Loose tassels of tangled fibers may appear on the sides and flanks, and considerable patches of the fleece may be lost. As yet the infestation has only been observed among fine-wool merino sheep, of which all ages and sexes may be affected, but other types of merino and other breeds of sheep may be susceptible. The course of the infestation is slow, and the most serious cases tend to occur among sheep over 3 yr. old. The life history of the parasite and effective methods of treatment and control remain to be worked out. It is pointed out that members of this genus appear to be recorded only as ectoparasites of mice and voles.

[Studies on baby-pig mortality].—I, **Acute hypoglycemia in newly born pigs (so-called baby pig disease)**, R. GRAHAM, J. SAMPSON, and H. R. HESTER. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 338-339).—A brief account is given of an unidentified highly fatal affection of newborn pigs, sporadic outbreaks of which have come to the attention of the Illinois Experiment Station during the last 8 yr. In the typical syndrome presented by pigs that suffer from the disease, apparently normal litters at approximately 24 to 48 hr. of age show symptoms of shivering, dullness, and inappetence. Affected pigs often emit a weak crying squeal. Coincident with the loss of appetite and weakness, the hair coat becomes rough and the affected pigs leave the nest and lapse into coma. Death of several or all pigs in the affected litters often occurs within 24 to 36 hr. after the first symptoms are manifested. The extent of the loss has ranged from 1 to 22 litters, representing approximately 5 to 95 percent of the pigs farrowed in some herds. At autopsy no gross pathologic lesions have been observed. Search of the tissues for a causative agent has given negative results. In chemical analyses of the blood abnormal amounts of the blood sugar were consistently encountered. Contributory evidence in support of the possible primary significance of acute hypoglycemia has been observed in the therapeutic response in naturally affected pigs following repeated injections of glucose solution. Pigs in the early stage of the disease show improvement in 2 to 3 hr. following dextrose therapy, while repeated injections of dextrose together with forced feeding of milk have demonstrated that the life of naturally affected pigs may be prolonged and that in some cases the treated pigs may recover. However, glucose therapy even if repeated appears ineffective in the terminal stages of the disease.

Studies on baby-pig mortality.—II, **Further observations on acute hypoglycemia in newly born pigs (so-called baby-pig disease)**, J. SAMPSON, H. R. HESTER, and R. GRAHAM. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 33-37, figs. 3).—Reporting further (see above), added support of the primary role of hypoglycemia in baby-pig disease is found in the observation that newly born pigs are apparently highly susceptible to the development of an intense fasting hypoglycemia during the first 12 and perhaps 24 hr. or longer after birth and relatively refractory to fasting hypoglycemia at the age of from 120 to 140 hr. It has been demonstrated that newly born, well-nourished pigs, 5 to 6 days old, are relatively refractory to the development of severe hypoglycemia when subjected to a fast of 1 week, during which time all of the stored liver glycogen would undoubtedly be exhausted. This observation suggests that the newborn pig requires a period of several days for the regulatory mechanism involved in the production of liver glycogen from noncarbohydrated material, such as tissue protein, to function effectively. If this mechanism is not ready and the two common sources of blood sugar—(1) absorption from the intestine and (2) reserve glycogen stored in the liver—fail, irrespective of cause, to maintain a safe sugar level, a fatal hypoglycemia becomes imminent.

Viability of eggs of the swine thorn-headed worm *Macracanthorhynchus hirudinaceus*, K. C. KATES. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 64 (1942), No. 2, pp. 93-100).—Laboratory tests were made of the effects of high and low temperatures, drying, alternate wetting and drying, and ultraviolet irradiation on the viability of eggs of *M. hirudinaceus*. The ability of the contained larvae to infect grubs of the green June beetle was used as a criterion. Eggs in water were destroyed by instantaneous exposure to a temperature of 70° C. and by 10 minutes' exposure to a temperature of 60°. In one series of preliminary tests, not so well controlled, a small number of eggs survived higher temperatures. The majority of eggs in water and in a dried condition survived continuous exposure to temperatures ranging from -10° to -16° for as long

as 140 days, when the test was terminated. No appreciable reduction in number of viable eggs was observed in dry preparations exposed for 50 days at temperatures of 5° to 9° and 37° to 39° and for 265 days at temperatures of 21° to 26°. Alternate wetting and drying at temperatures of 37° to 39° destroyed the viability of eggs on soil in 368 days. On the other hand, eggs subjected to alternate wetting and drying at temperatures of 2° to 5° were still viable after 551 days. Ultraviolet irradiation applied at a distance of 18 in. destroyed nearly all the dry eggs in a single layer in 10 min. Some eggs in films several eggs thick survived for 40 min. Some eggs in shallow water survived irradiation for as long as 120 min. The results are considered to explain the earlier findings that eggs of this worm may be viable on soil for as long as 3.5 yr. under Beltsville, Md., conditions (E. S. R., 86, p. 383).

The effect of phenothiazine on the hemoglobin concentration, erythrocyte count, and leucocyte count of swine, E. C. McCULLOCH and L. SEGHEITI. (Wash. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 2, pp. 80-84, figs. 2).—The results of an investigation of the effect of phenothiazine on hemoglobin concentration and erythrocyte and leucocyte counts are reported in detail in table form, and graphs are given showing the effect of this drug upon both the red cell count and the hemoglobin. Daily administration of therapeutic doses of phenothiazine, even over periods as long as ever would occur under practical conditions, was without apparent deleterious effect upon the swine used. Daily repeated administration of much larger doses over longer periods produced a marked and significant, although not fatal, decrease in the hemoglobin concentration of the blood and in the erythrocyte count. No significant change occurred in the leucocyte count. Although based upon a limited number of animals maintained under a single set of conditions, the data obtained indicate that the amounts of phenothiazine usually recommended for swine possess a large factor of safety.

Sulfaguanidine feeding as a control measure for cecal coccidiosis of chickens, M. M. FARR and R. W. ALLEN. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 47-51, figs. 2).—No symptoms, lesions, or coccidial forms were found in fowl fed a 2 percent sulfaguanidine mash for 3 days before inoculation with *Eimeria tenella* and for 9 days thereafter. Birds that were fed a 1 percent sulfaguanidine mash over the same period developed very light infections but showed no symptoms or severe lesions. Birds receiving either a 3 or 5 percent sulfaguanidine mash daily after the appearance of blood in the droppings were not significantly benefited, although oocyst production was sharply reduced. Birds protected from an initial infection of cecal coccidiosis by sulfaguanidine were highly susceptible to a reinoculation of 95,000 oocysts 29 days later. The average gain in weight of the inoculated controls was less than that of the birds receiving prophylactic doses of sulfaguanidine mash, but greater than that of the birds receiving medicated mash as a curative agent.

The present status of avian encephalomyelitis, E. JUNGHER and E. L. MINARD. (Univ. Conn.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 778, pp. 38-46).—This discussion is presented with a list of 40 references to the literature cited.

Fowl leukosis—manifestations, transmission, and etiological relationship of various forms, E. P. JOHNSON (*Virginia Sta. Tech. Bul.* 76 (1941), pp. 21, figs. 14).—The manifestations in birds injected with (1) Virginia strain leukosis agent and (2) B. A. I. strain A leukosis agent in the course of experimental work on the transmission of fowl leukosis are reported in tables. The blood reaction in birds inoculated with these two strains and which became affected as determined from periodic blood smears and finally from gross and histologic post-mortem findings, the manifestations in control birds during the

course of the experiment, and the number of birds inoculated and incidence of disease in each group are also presented in tables.

It was found in experimental transmission of fowl leucosis through chick embryos that intravenous injections resulted in a much higher incidence of successful transmissions than when the material was placed on the chorioallantoic membrane. Likewise, very little difficulty was encountered from contamination and from the introduction of nonspecific infectious materials when the intravenous method was used. However, embryos did not seem to be more susceptible to the leucosis materials than did day-old or even week-old chicks. Young chicks appear to be most suitable for transmission experiments.

In an experiment with "Leghorn chicks from a source relatively free from any form of leucosis and having a history known for several years, comparative data on results of injections with leucosis materials used over a period of years (Virginia strain) and leucosis materials (B. A. I. strain A) were obtained. The latter strain had produced in susceptible Rhode Island Red chicks and embryos for several passages entirely erythroblastic leucosis and what appears to be almost completely hemocytoblastic, with very little if any differentiation taking place. When these leucosis materials from two different sources were inoculated into Leghorn birds whose history indicates comparative freedom from natural occurrence of the disease the results suggest clearly that the birds receiving the inocula determine to an important degree the incidence, course, and form of leucosis that will result in transmission experiments. These results, moreover, give encouraging support toward the possibility of breeding genetically resistant birds whose offspring rarely develop any form of the leucosis complex. In this experiment 50 Leghorn birds were inoculated with B. A. I. strain leucosis agent and 23 or 46 percent of these developed some form of the disease. Sixty-three similar birds were inoculated with Virginia strain leucosis agent and 21 or 33.3 percent developed some form of the disease. Of 98 similar birds from the same source and used to control the experiment, only 8 developed any form of the disease. The high incidence of hemocytoblastoma (lymphocytoma) which occurred in these experiments leaves no doubt as to the transmissibility of this form of the disease. The relatively high incidence of this form resulting from an inoculum that was producing almost exclusively erythroblastic leucosis for several passages in highly susceptible Rhode Island Red chicks furnishes additional evidence in favor of the view that a common causative agent may produce a multiplicity of expressions of this disease complex.

"Of 26 ring-necked pheasant chicks (*Phasianus torquatus* Gmelin) inoculated intravenously with blood from a case of neural lymphomatosis due to Virginia strain leucosis agent, only 3 became affected during an observation period of 12 mo. One of these had neural lymphomatosis and 2 had the visceral form. None of 14 similar birds kept as controls developed symptoms of any form of the disease, nor were any lesions present at autopsy suggestive of any form of the disease."

Included is a list of 15 references to the literature cited.

The anti-perosis complex, L. R. RICHARDSON and A. G. HOGAN. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 2, pp. 459-461).—It is shown that at least one nutrient in addition to choline and manganese is required to prevent perosis in chicks, and that this substance is not identical with any of the recognized vitamins. The fuller's earth adsorbate of the water extract of liver and a 0.2 N ammonia eluate of the fuller's earth adsorbate are fair sources of the nutrient. The perosis due to a deficiency of the unidentified factor is similar to that produced by a deficiency of manganese or choline but is usually less severe. It is pointed out that were it possible to

supply all other essential unrecognized vitamins in a concentrated form the chicks in all probability would grow faster and probably develop more severe symptoms.

Eradication of pullorum disease from turkey flocks, W. R. HINSHAW and E. McNEIL. (Univ. Calif.). (*U. S. Livestock Sanit. Assoc. Rpt.*, 44 (1940), pp. 178-194).—A plan prepared by the California Experiment Station for eradicating pullorum infection from the flocks of 80 members of a San Diego County, Calif., turkey growers' association, containing 22,000 breeder hens, that was inaugurated on July 1, 1939, is described and the progress reported. The project adopted includes testing all birds for carriers by use of the standard tube agglutination method (1:25 dilution) at monthly intervals until one negative test is obtained, field supervision of flocks, inspection of hatcheries, and frequent educational conferences. When the 80 flocks, containing 28,810 birds, were tested in the 1939-40 season, 40 of them (8,718 birds) were free on first test, and by the end of the season a total of 64 were free (80 percent of the flocks and 68 percent of the turkeys). The remaining 16 infected flocks were tested at monthly intervals until the end of the hatching season. There was good evidence that the majority of these losses in 1939 resulted from the purchase of eggs from three ranches. In 1940, 81 percent of the flocks and 81 percent of the turkeys (17,181 birds) were free on first test as compared with 50 percent of the flocks and 30 percent of the turkeys free on the first test in 1939. The infected flocks of 1940 were either sold or cleared by retest, so that all flocks now supplying eggs have the equivalent but unofficial status of the U. S. Pullorum Passed grade. A total of 600,000 eggs were sold to midwestern and eastern hatcherymen in 1939-40 without a single complaint of losses from pullorum disease. Data on 49,890 tests made during 1939-40 showed that 1.77 percent of the males and 4.23 percent of the females were reactors. In no instance in 1940 was there an outbreak of pullorum disease in a flock which came from eggs laid by a negative flock (either on first test or by retest) and hatched by a hatchery accepting only eggs of like status.

This work has been referred to in an article by Harshfield (*E. S. R.*, 85, p. 541) the implication in the abstract that the studies were carried on in Colorado being erroneous.

AGRICULTURAL ENGINEERING

[**Agricultural engineering work of the Department**] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1941, pp. 222-227, 230-233).—The work of the Rural Electrification Administration and its relation to national defense requirements is reported upon, as is also the work of the Bureau of Agricultural Chemistry and Engineering on farm machinery and on heating, storage, and electrification.

[**Agricultural engineering investigations of the Bureau of Agricultural Chemistry and Engineering**] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt.*, 1941, pp. 69-80).—The topics reported upon are farm-house research; buildings for livestock; silage-pressure studies; potato, corn, wheat, and grain-sorghum storage; pest-control equipment; fertilizer-distributing and crop-production machinery; ginning and packing cotton; fiber-flax processing; and uses for electricity in farming.

[**Agricultural engineering investigations by the Wisconsin Station**] (*Wisconsin Sta. Bul.* 453 (1941), pp. 49-57, 63-64, figs. 6).—The work reported consists of a comparative experiment by S. Witzel, E. Heizer, E. Zehner, and A. Einerson on open shed as against insulated and fully equipped dairy barns; brooder house experiments and design of a satisfactory home-made electric brooder, both by H. D. Bruhn; the use, by F. W. Duffee, of combine engines to do

additional belt jobs to justify their extra cost; design of a new crop blower and a new wagon box for chopped forage, both by Duffee, Bruhn, and G. H. Larson; practical bituminous channel linings for terrace outlets, by H. B. Atkinson and R. S. Calkins (coop. U. S. D. A.); the determination by oxidation-reduction potential measurements of the degree of sewage purification and the condition of the sludge produced in the activated sludge method, by G. A. Rohlich, W. B. Sarles, and L. H. Kessler; and the chlorination of raw sewage, by D. H. Hunter, N. W. Staalson, and Sarles.

More rational "normal" proposed, J. C. MARR (*Agr. Engin.*, 22 (1941), No. 9, p. 315).—The average or arithmetical mean may fail to express the usual, typical, or ordinary condition in accordance with the common conception of the term. The "median," the quantity exceeded in half the cases and not reached in the other half, may often be more nearly representative of the "normal" in the commonly accepted sense. Examples taken from a meteorological record showed a use of the arithmetical mean as a normal capable of the absurdity of representing the rainfall for a given month as below the normal for that month in 74 out of 100 yr.

Hydraulics of water in unsaturated soil, L. A. RICHARDS. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 9, pp. 325-326, figs. 6).—This is a simplified exposition of the theoretical and practical principles of the soil moisture tensiometer.

Hydraulics of sprinkling systems for irrigation, J. E. CHRISTIANSEN. (Univ. Calif.). (*Amer. Soc. Civ. Engin. Proc.*, 67 (1941), No. 1, pp. 107-125, figs. 12).—In 1932 (about 2 yr. after portable systems for sprinkling agricultural crops were first used in California) the Division of Irrigation of the University of California began a study of sprinkling, principally to determine (1) the hydraulic characteristics of rotating sprinklers, (2) the loss of water by evaporation, (3) the hydraulic characteristics of sprinkler lines, (4) the cost of applying water by sprinkling, and (5) the general success of sprinkling as a method of irrigation. The present paper is concerned with the first three of these subjects.

From field observations and from an analysis here given, it is concluded that sprinklers must be placed closer together than is indicated by the study of symmetrical patterns. The usual spacings of 20, 30, and 40 ft. along the line and from 50 to 70 ft. between lines give fair results when there is adequate pressure and little wind. The customary spacings of from 60 to 90 ft. both ways for stationary overhead orchard systems, however, cause an appreciable variation in application. For evaporation from the spray an expression was derived from the general evaporation formula by assuming that the insolation, the conduction, and the back radiation are negligible and can be omitted. The sensible heat is indicated by the change in the temperature of the water. Loss from this cause was found to be less than 1 percent. Loss from the wet surface of soil and plants during and following the application of water probably exceeds that from a free water surface, however, because of the relatively larger area exposed, and, although the rate decreases rapidly as the surfaces dry and becomes negligible after about a week, during this time the total loss may have exceeded an inch of water. One of the practical results of the analysis of sprinkler line hydraulics is that of emphasizing the advantages of using two short lines supplied from a source through the center of the field instead of a single line of twice that length supplied from a source along one side of the field.

A comparative study of standard agars for determining bacterial counts in water, W. L. MALLMANN and R. S. BREED. (Mich. and N. Y. State Expt. Stas.). (*Amer. Jour. Pub. Health*, 31 (1941), No. 4, pp. 341-343).—The old

standard agar (used for milk analyses prior to 1939) and the new standard (TGEM) agar were used in parallel tests on various types and sources of water. Plate counts on the new agar were consistently higher, but the differences were not considered significant, leading to the conclusion that the new standard agar could be substituted for the old for determining the bacterial content of water supplies without causing significant misinterpretations of data.

Experiences in operating a chemical-mechanical sewage treatment plant, G. J. SCHROEPFER (*Amer. Soc. Civ. Engin. Proc.*, 67 (1941), No. 1, pp. 61-92, figs. 3).—The author presents data concerning the performance of the plant and the cost of operation and maintenance, as well as on the improvement of the Mississippi River which has resulted from its first 2 yr. of operation. Some of the problems that arose in early operation, the methods used to overcome them, and other improvement changes which have been incorporated to simplify operation or effect economies are discussed.

Consolidation of elastic earth layers, D. L. HOLL (Iowa State Col.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 2, pp. 319-328).—The author presents a mathematical analysis of saturated earth layers of finite and infinite depth. In the axially symmetric case several types of boundary conditions are considered.

Gravel-rock overfall structures, T. P. POWELL (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 11, pp. 384-385, figs. 7).—This method of construction is intended to furnish adequate soil protection with a minimum requirement of material, skill, and time. The necessary filter is produced by making the drop excavation with a 4 : 1 slope on the channel bottom, placing gravel-filled trenches across it and along the sides, adding a 2-in. overall layer of gravel, and shingling the surface with rock in a single layer except at the overfall. At the overfall the rock layer is double, with small, odd-shaped material and gravel dumped behind it to fill the space provided. Correct placement of intermediate size material is especially emphasized, each rock being placed with a downstream edge touching that of another and with as large a V crevice opening upstream as is possible. The crevices are to be filled with graded material.

Terrace system planning to reduce point rows, E. C. BUIE (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 9, pp. 321, 324, figs. 2).—To reduce point-row areas to a minimum and eliminate all possible sharp turns and bulges in terrace lines, all terrace systems are planned on topographic maps. A survey crew composed of three or four men makes a topographic map of the field to be terraced. The contour interval usually will vary from 1 to 5 ft., depending on the slope. The completed map is given to a trained planning engineer, who, with due reference to the farm, farm equipment, and farming methods used, designs the terrace system on the topographic map. The survey crew then lays this system out on the farm. The entire cost for the plan should not exceed 7 ct. per acre on slopes ranging from 0.5 to 3 percent. This type of planning can also be applied to water erosion problems in relatively small fields with steep slopes.

Outlet design for terraced lands, D. CHRISTY (Tex. A. and M. Col.). (*Agr. Engin.*, 23 (1942), No. 1, pp. 12-14, fig. 1).—The author discusses the determination of the values required for the $Q=CIA$ equation, presenting a nomogram for the determination of C . He reaches the following, among other, conclusions: The vegetated ditch becomes the least expensive constructed ditch on slopes greater than 4 percent. However, the vegetated ditch outlet cost (from \$11 to \$13.50 per acre) is, in general, more than the terracing system is worth when the cost of the terracing is added to it. It may be cheaper and more feasible to turn the water onto a strip of waste- or low-value land to allow that strip

to wash away than to try to protect the outlet. This practice is considered satisfactory only where rock is near the surface.

Of a large number of vegetated outlet ditches examined about 80 percent were satisfactory, but when the design velocity was less than 2 ft. per second silting caused a high percentage of failures. At design velocities over 8 ft. per second, on the other hand, the percentage of failures due to erosion was high. The road ditch may be a satisfactory outlet if suitable cooperation between the farmer and the highway department can be secured.

A concrete-lined outlet ditch is cheapest when the steepest part of the field is used as an outlet but is difficult to design (high velocity introducing some special requirements), and is costly in part because of the need for expensive checks at the foot of the slope. The service record of these outlets was excellent, but the cost was high.

The rational run-off formula, while subject to considerable error, will give satisfactory results in the hands of the average agricultural engineer. "The best outlet engineer is one who can, after a critical analysis of labor and materials available, design the least expensive serviceable outlet, . . . not the man who can, with unlimited funds, labor, and material, build a great monument."

Sawdust-concrete test results, L. W. NEUBAUER. (Minn. Expt. Sta.). (*Agr. Engin.*, 21 (1940), No. 9, pp. 363-365, figs. 5).—A sawdust-concrete floor was placed in a hog barn. Some of the mixtures used set very slowly. Testing of 698 cylinders made up from 11 species of wood were then made. Kind of wood, size of particles, proportions, water:cement ratio, age, and method of curing were recorded. With some sawdusts little strength was secured, and none of the sawdusts gave much strength. If enough cement was used to give strength the insulation value was lost. The soluble vegetable matter in a given sawdust was found to be an index to the strength of the concrete made from that sawdust. Because of the variables noted it is difficult to give safe rules for making sawdust concrete. It is advisable to make a trial batch at least 2 days before mixing sawdust concrete in quantity.

What is new in farm machinery, E. A. SILVER. (Ohio Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 11, pp. 381-383, 385, figs. 2).—This is a general discussion of needs and current practice, noting progress in hay harvesting equipment, corn combining, hay transportation and green grass handling, harvesting of alfalfa for artificial dehydration, etc.

Power alcohol in tractors and farm engines, E. L. BARGER. (Kans. State Col.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 65-67, 78, figs. 6).—The author tabulates physical properties of mixtures of anhydrous ethyl alcohol denatured for motor-fuel use with tractor fuels including regular and third-grade gasoline and distillates. He reports octane numbers for alcohol admixtures of from 0 to 25 percent with regular, third-grade, and third-grade leaded gasolines and four distillates, and gives various cost data on the basis of the price of 25 ct. per gallon, which was paid for the alcohol used in these experiments. A supply at this figure is said to be no longer available. About 3.5 times as many B. t. u. were obtainable from gasoline, and about 5.5 times as many from distillate, per unit of cost as from alcohol. Fuel costs per horsepower-hour and per acre in plowing with a tractor-drawn 2-bottom, 14-in. plow were determined, as were also distillation characteristics of the mixtures, separation temperatures, thermal efficiencies as related to brake horsepower, etc. The alcohol and alcohol blends gave 33.5 percent higher maximum horsepower than did the 46.5 octane gasoline with which the alcohol was mixed, and the 15 and 25 percent alcohol mixtures gave intermediate values. The thermal efficiencies of the alcohol and mixtures were greater than those of the gasoline, and the blends were equal

to or better than the straight gasoline in specific fuel consumption while the 100 percent alcohol ran a good bit higher. In terms of horsepower-hours per gallon, the blends were equal to or better than the gasoline, but 100 percent alcohol fell short. In fuel cost per horsepower-hour, the gasoline was lowest, except at heavy-load operation where detonation was serious, when the 15 and 25 percent blends were equal to the gasoline. The 100 percent alcohol fuel cost curve ranges about 3 times as high as the 100 percent gasoline curve. Similar engine tests on alcohol-distillate mixtures are reported.

Tractor stop-hitches, A. W. CLYDE. (Pa. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 1, pp. 5-8, figs. 7).—The spring drawbar, though again in use for some plows on small tractors, is usually inadequate. Adding a mechanism to declutch the tractor when the drawbar pull exceeds the normal pull by a predetermined force improved the protection of the plowshares. A complete release relieving the spring entirely of the normal pull and so leaving its entire capacity available for stopping the tractor provided against damage by heavier tractors or higher speeds. A medium size of this device was found to have a capacity adequate for a 4,500-lb. tractor going nearly 3 miles per hour on level ground (17,300 in.-lb.). It is pointed out, however, that the spring alone as a means for stopping the tractor has the two inherent defects of a force varying from zero or a low value to a maximum (whereas a more nearly constant force would be preferable), and lack of provision for releasing energy stored in the spring. For dissipating the spring energy a hydraulic cylinder was built into the hitch above noted, check valves in the piston being provided to facilitate recoupling. This combination made both the stopping and recoupling very smooth. The constant resistance permitted fair protection even of cast shares on one- and two-bottom plows without extreme stopping distance. Some further devices of the same general nature are discussed. A calculation method to determine certain design factors for such hitches is shown, together with a calculation of the hydraulic cylinder orifice areas based on principles related to those of gun recoil control mechanism.

A simple power wood saw, M. A. SHARP. (Univ. Tenn.). (*Agr. Engin.*, 22 (1941), No. 9, p. 310, fig. 1).—Reciprocating motion is obtained by driving an old-type reversing steering gear with a 0.25-hp. motor pulley, ratio of 2.5:8. The motion is applied to a 3.5-ft., one-man crosscut saw. The drive bar, thrust bar, mounting of motor, and gear sets are described. A photograph shows the general nature of the set-up.

Machinery for sugar cane production, H. T. BARR. (La. State Univ.). (*Agr. Engin.*, 22 (1941), No. 9, pp. 322, 324, fig. 1).—The author describes correct practice in Louisiana cane growing and notes the machines employed.

Machinery for sweet potato production, J. W. RANDOLPH. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 11, pp. 386-388, figs. 4).—Although sweetpotato starch has obtained commercial acceptance, increasing demand, and premium prices, the crop production costs must be lowered from an estimated average of 25 ct. per bushel to a figure permitting profitable factory delivery at from 10 to 15 ct.

For seedbed preparation the cotton growers' equipment and methods were found generally suitable, except that sweetpotatoes need a high bed during the entire growing season, whereas cotton beds are comparatively low and the small power units available give shallow tillage. This tends to develop a definite plow sole and limit yields. Costs for plants can be reduced by the use of available information and home-made equipment from \$17.50, for close spacing of plants from commercial sources, to about \$3 per acre. Current cultivation practice is briefly noted. With reference to harvesting, it is pointed out that dirt, "strings" or enlarged roots, and rot are the only restrictions,

giving opportunity for the development of high-capacity digging and transportation methods without regard to roughness of handling, and various improvements resulting in lowered harvesting costs have been made. The rod type mechanical white potato digger is not effective when the sweetpotato vines are green and rank. Fair results have been obtained with this digger when the vines were previously hoed from the row or by pulling the digger with a tractor equipped with an A-frame vine cutter (a special disk-hiller attachment on a standard cultivator frame). A direct-mounted tractor unit developed by the Bureau of Agricultural Chemistry and Engineering was extensively used during two seasons with excellent results. In one field, previously harvested with mule equipment, this unit gathered an additional 30-35 bu. per acre (from 15 to 22 percent increased yield). Another machine, used only in 1940, was a combination digger and truck loader. For collecting the dug crop, use of the bagging sled has become common practice, saving much time and labor. An experimental rubber-tired cart has been found preferable to the sled, however, because a greater number of bags can be handled and pulled to the "turn row" with the same mule power.

Automatic feed control for small feed grinders, C. J. HURD (*Agr. Engin.*, 22 (1941), No. 2, p. 69, figs. 2).—The current supplying the motor is passed through a solenoid containing a plunger operating against a return spring of which the tension is so adjusted as to overcome the pull of the solenoid at about 85 percent of full motor load but to permit the solenoid plunger to be drawn in when the motor current passes that giving rated horsepower, thereby opening the circuit of the electromagnetic vibrator of the feed table and so stopping the feeding of grain to the grinder. Both capacitor and repulsion-induction motors in the $\frac{1}{2}$ - and 1-hp. sizes have a $\frac{3}{4}$ - to 2-a. current increase between 75- and 125-percent loads, and the solenoid control operates on a total differential of $\frac{1}{4}$ a. It is believed that this controller is best suited for mills of 1 hp. or less, or when the grinder is to be used exclusively for grinding shelled corn or small grain.

Drying artificially heated wheat with unheated air, C. F. KELLY. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 9, pp. 316-320, figs. 6).—The experiments reported upon were designed to show relationships between initial temperatures and moisture contents of the wheat and the dry-bulb temperature, humidity, pressure, and outlet temperature of the drying air. Effects of variations in the depth of the wheat layer during drying and of other factors involved in the design of the drier are also considered. Experiments were made at initial temperatures of 121°, 137°, 147°, and 156° F., and with wheat depths in the drier of 6, 12, and 24 in. Data which may be used either for designing or selecting the best operating conditions for driers already constructed are given in tables and charts.

Relation of agronomic and nutritional factors to engineering problems and farm practices in making grass silage, T. E. WOODWARD. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 54-56, fig. 1).—The author points out as advantages of conversion of grass and some crop residues into silage that waste through the refusal of cattle to eat the coarser parts of the dried material is entirely eliminated, and that when weather conditions render the making of good hay impossible converting the grass into silage will conserve nutrients lost when only poor hay can be made. Grass and legume silage will be advantageous in regions where considerable quantities of poor hay are produced but not in regions where hay is uniformly good. An essential for the production of mold-free silage is the elimination and exclusion of air by chopping fine, weighting down with 2 or 3 ft. of green material at the top of the silo, and making the

walls and doors of the silo airtight. It was found that moisture in excess of 68 percent creates a danger of loss by leakage, subjects the silo to unnecessary lateral pressure, and produces silage of lower palatability and nutrient content. Making the silo wall impervious to air by painting with asphalt dissolved in gasoline prevented mold. Desirable engineering improvements are field choppers that will pick up and chop material either by mowing it or by taking it from the windrow at will; a bucket-type elevator to eliminate the blower pipe clogging, caused by finely chopped crops and crops wet with external moisture; and means for draining the excess juice so that it will not seep through the walls of the silo. A discussion by G. R. Shier is appended.

Observations on the storage of grass silage, H. E. BESLEY and J. R. McCALMONT. (N. J. Expt. Stas. and U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 51-53, figs. 4).—Foundation drains showed promise of giving satisfactory operation, particularly when pressures are not excessive. Vertical joint leakage from concrete-stave silos may be controlled to some extent by prestressing the hoops, but joints must be redesigned or provided with seals before general satisfaction can be expected. Results of the New Jersey tests on coatings for concrete were found not at all promising. Other observations seemed to indicate that varnishes and synthetic resin with wood-oil vehicles, asphalts, coal tars, and portland-cement washes will probably give some satisfaction. In choosing an asphalt or coal-tar preparation, care should be taken to select one that has a high melting point in order to minimize sticking of the silage. Silos should be adequately reinforced. Silos with exposed reinforcing are likely to be more satisfactory for storing high-moisture silage than those with reinforcing concealed in the mortar joint because of the likelihood of the mortar failing and leaving the steel exposed to the action of the silage acids. Exposed reinforcing can also be prestressed, thereby lessening the tendency for cracks to open in the walls. It can be inspected at will, and repairs or replacements can easily be made when necessary. Under usual farm conditions silos of average size will hold about the same tonnage of grass as of corn.

Equipment, methods, and costs of collecting farm crop residues, R. B. GRAY. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 57-58).—The author suggests sets of specifications for moisture, chaff and dirt, and weed contents, for baling and bale size for straw to be delivered to strawboard manufacturers, and for cornstalks to be delivered to the processors, the latter specification including maxima for moisture content, leafy material, kernels, and dirt. Cost data concerning gathering of straw and stalks and five possible schemes for cutting and baling straw are discussed.

Equipment, methods, and costs of collecting corn stalks, J. B. DAVIDSON. (Iowa Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 2, p. 68).—The author points out that the development of cornstalks as a raw material for the manufacture of paper, strawboard, and the like is impeded by the high cost (from \$8 to \$10 per ton) at the factory and the low return to the corn grower. An approximate cost distribution on the basis of \$10 per ton at the factory is given, and points of attack to be considered in an effort to reduce the total cost and increase the return to the farmer are indicated. Baling is especially noted as an expensive operation which might be replaced by chopping if the stalks were to be delivered to a factory nearby. It is also pointed out that the more palatable portions of the stalks, useful as a feed but of little value for manufacturing purposes, might be separated from the industrially valuable coarser portions and retained for farm use. Collecting the stalks at the time of picking or field shelling might also be tried out.

The purchase of fencing on specification, S. A. BRALEY (*Agr. Engin.*, 22 (1941), No. 2, pp. 49, 50, fig. 1).—The two factors emphasized as of greatest importance in the corrosion resistance of galvanized wire are the resistance to cracking of the zinc coating on wrapping or twisting the wire about itself in forming end loops and the weight of the uniformly distributed coating. It is noted that the alloy composition of the base metal has a great influence on the adherence of the coating and that maximum corrosion resistance in the base metal itself is very important, the presence of from 0.2 to 0.3 percent of copper in the steel wire adding materially to its corrosion resistance. Though farm fence is not usually manufactured to A. S. T. M. specifications, the purchaser can look for the heaviest coating obtainable for equal or slightly greater cost, and thereby obtain an increase in the life of the protective coating entirely out of proportion to the slightly increased cost. The author's criteria are summed up in the four questions: Does the base metal of the fence have the greatest corrosion resistance, once the protective zinc coat has corroded away? Is the base metal of such composition that the zinc adheres sufficiently so that normal distortion of the wire during fabrication does not cause it to crack and peel? Is the amount of zinc on the wire the most that can be obtained without excessive extra cost? Will the fence maintain approximately the same lustrous finish that it has when purchased?

The electric fence, C. F. DALZIEL and J. R. BURCH. (Univ. Calif.). (*Agr. Engin.*, 22 (1941), No. 11, pp. 399-406, figs. 9).—From a detailed study of the characteristics and performance of a number of types of electric fence designs, the authors conclude that it is impossible to design an electric fence controller which will be safe for all individuals. The noninterrupted A. C. electric fence with a current limitation of 8 ma. is believed dangerous. The noninterrupted D. C. fence with a current limitation of 15 ma. is believed reasonably safe. The intermittent types of electric fence controllers as approved in present regulations, although possibly safe electrically, should be considered inhumane. The single impulse electric fence controller is believed to be a satisfactory and reasonably safe solution of the electric fencing problem. The shock hazard from the charge on the average 10- to 15-mile electric fence wire is believed small.

Radiation in agriculture, J. P. DITCHMAN (*Agr. Engin.*, 22 (1941), No. 11, pp. 389-390, figs. 2).—The author briefly discusses the radiant energy output of various types of filament and vapor arc and other gaseous discharge lamps, the use of the infrared radiations for brooder warming, crop dehydration, and other heat treatment and of the ultraviolet for irradiation and sterilization, and the nature and some operating characteristics of a new short-tube, small-bore, high-pressure mercury vapor arc consuming 1,000 w. in the lamp proper and requiring cooling by water or other circulating liquid. The cooling liquid may be milk or other liquid requiring irradiation for sterilization or for vitamin D production. Tables of percentage of the over-all input radiated in various wavelength bands in the ultraviolet, visible, and infrared ranges for various sodium vapor, mercury vapor, fluorescent, and filament lamps are included, together with percentages of solar energy in similar bands at the earth's surface at Washington, D. C.

Effect of short-wave irradiation on farm animals, T. E. HENTON. (Ind. Expt. Sta.). (*Agr. Engin.*, 22 (1941), No. 2, pp. 47-48).—This is a brief review of work on the ultraviolet irradiation of poultry and cattle. Some results of poultry irradiation by means of 250-w. CX lamps are mentioned. It is noted that the irradiation from these CX lamps contains only from 1 to 7 percent as much of the highly effective mercury-arc wavelengths 280.4 and 296.7 μ as does that from the 100-w. S-4 lamp.

New electric lamp brooder, D. C. KENNARD and V. D. CHAMBERLIN (Ohio Sta. Spec. Cir. 63 (1942), pp. 7, figs. 4).—This brooder consists essentially of a 4- by 4-ft. top and 1-ft. sides made from a 4- by 8-ft. piece of $\frac{1}{4}$ -in. plywood or sheet of $\frac{1}{8}$ -in. hard fiberboard, top and sides being nailed to 1- by 1-in. cleats so that the sides project 4 in. above the top to provide space for litter-insulation material, the whole supported on four 16-in. legs $1\frac{1}{2}$ by $1\frac{1}{2}$ in. and heated by one 150-w. reflector-type flood lamp and one 250-w. drying lamp. It was found unnecessary to provide either thermostatic control or mechanical ventilation. Side curtains were used only when the behavior of the chicks indicated draft. When curtains were needed, strips cut from feed bags and made 4 ft. by 8 in. were satisfactory. These brooders have proved effective in extensive use throughout the year under widely varying conditions.

Heating studies of an outdoor brooder, J. B. GREINER. (U. S. D. A.). (Agr. Engin., 22 (1941), No. 11, pp. 391-392, figs. 2).—A group of 14 brooders, 2 heated by kerosene lamps and the remaining 12 by a variety of electric units variously insulated, were subjected to 4 series of tests, 1939-41. All of the brooders were of inexpensive construction. Modifications of design found necessary for convenience or efficiency included changing from bimetallic to wafer and snap-action, switch-type thermostats operated from outside the brooder. Among heating units discarded or changed were the bowl-type radiant heaters and heating coils in the shrouded air passage in the rear of the brooding compartment. In the final series of tests the brooders heated by 250-w. reflector drying lamps were first and second in economy of electricity consumed per unit, and a non-fan-equipped commercial package unit was third in economy. Two of the fan-equipped units were fourth and fifth in economy. Throughout these tests the brooders heated by kerosene oil lamps as checks have been more economical when costs of electricity and oil are compared. Electricity was cleaner and more convenient, however, and lowered the labor requirements.

Citrus growers profit by refrigeration research (U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1941, p. 22).—A 50-percent increase in the number of orange boxes per car having necessitated special fan equipment, car wheel-driven fans were placed in several hundred cars and were found more effective at normally low temperatures and during much of the season than was car icing alone.

How to obtain adequate farm housing with limited income, D. G. CARTER (Agr. Engin., 22 (1941), No. 9, pp. 309-310).—Much of this housing must be done with noncommercial grades of material and cash outlays of less than \$500. In 200 cases studied the author found that the farm was able to contribute an average of about 75 percent of the labor and sufficient materials to make the noncash contribution equal to slightly more than one-half the total house value. The average income of the families included in the study was about \$700 (median, about \$500). The typical cash expenditure was approximately equal to 1 year's income, and the resulting house value was \$1,500 (median, \$1,300). There are approximately 2,000,000 farm families in the lower one-third by income classification, the average housing condition within this group being substandard and the need for improvement critical. If a program of "self-help" in labor, materials, and technical aid can be developed, housing can be attained by a large number of families. In every case there will be some cash expenditure for materials, probably averaging \$500 or more per unit. This cash expenditure will be utilized for the materials that afford a higher standard of quality, rather than for the rough or bulk materials.

Balancing farm structures with farm capabilities, J. A. SLIPHER. (Ohio State Univ.). (Agr. Engin., 22 (1941), No. 9, pp. 311-312).—This paper considers only functional structures, living quarters being left aside. As the basis for

determining what and how much functional structure is optimal, the author proposes to start from the productivity indexes when available, since maximum productive capacity of the soil is a fundamental fixed point. From the productivity index "we may calculate (1) the volume and weight of each harvested crop to be stored if the cropping program were conducted at the 'normal' or at the 'attainable' level, and (2) the number and kind of livestock that these crops as feed will support and that the structures are to accommodate." In addition to the space and strength requirements thus indicated, the necessary degree of stabilization of temperature and humidity and of dust control must also be known and provision for advantageous use of the required labor must be made. The paper is an analysis of the broad fundamentals of the problem and is not concerned with structural designing per se, with materials, or with building costs, but rather with the "duties of a structure to the enterprises of which it is an organic, functional part."

Farm buildings—tombstones or tools, D. H. DOANE (*Agr. Engin.*, 22 (1941), No. 9, pp. 313-315).—The author stresses the viewpoint that farm buildings should be planned rather for use value than for extreme permanence. A structure built to outlive its usefulness violates the principle that there should be minimum obsolescence value left to throw away at the end of the useful life of the building.

Fireplaces and chimneys, A. H. SENNER and T. A. H. MILLER (*U. S. Dept. Agr., Farmers' Bul.* 1889 (1941), pp. [2]+52, figs. 44).—This supersedes Farmers' Bulletin 1649 (*E. S. R.*, 64, p. 686). It first takes up chimney design, construction, and cleaning and repairing flues in considerable detail. Fireplaces of both indoor and outdoor types are then discussed, the indoor constructions dealt with including such modified fireplaces as the Franklin stove and designs providing for circulation of air from the room through ducts heated by the fire, with return to the room through grilles or registers above the fireplace. Beauty and appropriateness of design are considered, as well as safety, effectiveness, and convenience.

Watch your step: Farm safety for national defense, W. BRINK (*U. S. Dept. Agr., Misc. Pub.* 481 (1942), pp. 32, figs. 9).—Possible causes of accident or injury likely to be found in buildings, farm machines, electrical equipment, gasoline and other inflammable materials, home appliances, and farm animals are pointed out. Causes of fires, fire prevention, and provision of adequate fire-fighting facilities are among the subjects especially stressed, as are the numerous causes of minor and major personal injuries. Preventive or protective measures are suggested wherever practicable. Figures showing agriculture to be the most hazardous occupation are graphically presented.

AGRICULTURAL ECONOMICS

[War problems in agricultural economics] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1941, pp. 1-24, 27-65, 79-117, 121-155, 166-175, 182-195, 220-222, 237-239).—This report to the President of the United States describes the wartime task of the Department and of agriculture. The phases applying more or less definitely to agricultural economics and not noted elsewhere are discussed in sections as follows: Impact of war and defense effort on agriculture, price conditions and farm-price policy, our farm exports in wartime, commodity agreements among nations, food situation in Europe, our cooperation with Latin America, preparing post-war foreign-trade policy, agriculture's requirements for defense production, organization to handle the Department's defense relations, special defense functions in the Department, locating defense industries and military and

naval reservations, the wartime job of the A. A. A., the commodity loans, farm conditions in 1941, the year's production, the cotton problem, handling the wheat surplus, sugar supplies for American consumers, wartime changes in the tobacco situation, fruits and vegetables, the defense response in livestock products, poultry and eggs for defense, dairy production for defense and lend-lease shipment, pressure on storage facilities, lend-lease buying and surplus distribution, crop insurance, our changing crop map, preparing for the impact of peace, agriculture in post-war readjustment, the shelf of projects, agricultural planning, reports of State committees on farm requirements, hired labor in agriculture, evolution of our land policy, land legislation of State governments, shortage of farms to rent, land values and land speculation, farm credit problems, marketing facilities and methods, agricultural aspects of current irrigation problems, and the commodity exchanges.

Report of the Chief of the Bureau of Agricultural Economics, 1941, H. R. TOLLEY (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt., 1941, pp. 51*).—This report to the Secretary of Agriculture for the year ended June 30, 1941, describes and discusses the activities of the Bureau under the following headings: A democracy uses its experts in a time of crisis, blending research and planning into programs for action, unifying policies through interbureau cooperation, and focusing Bureau of Agricultural Economics activities on farmers' local problems. Appendixes include tabular examples of the year's work of the Bureau and a list of publications issued during the year.

[Investigations in agricultural economics at the Georgia Station]. (Partly coop. U. S. D. A.). (*Georgia Sta. Rpt. 1941, pp. 8-15, fig. 1*).—Included are brief descriptions of farm management studies in Greene and Gwinnett Counties, a study of 10 of 12 farmer wholesale fruit and vegetable markets of the State, and a study of the 1940 cotton ginnings of the State. Some brief general findings are given for each study. A map shows the types of tenancy areas of the State. The principal characteristics of each area are described.

Farm income [studies in Wisconsin]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 453 (1941), pp. 34-45, 46-47, figs. 3*).—A discussion of county management of tax-delinquent land, by G. Wehrwein and P. Raup; changes in livestock markets, by M. A. Schaars and A. Hobson; southern dairy competition, by W. P. Mortenson and Schaars; how to select the better-paying and most productive farms, by P. E. McNall and D. Anderson; milk production with little grain, by H. O. Anderson and McNall; badly eroded areas call for drastic changes, by McNall, L. A. Salter, and H. O. Anderson; and returns from farm wood lots, by H. O. Anderson, D. Keyes, and McNall.

Incoming and outgoing payments of Iowa farm families, L. WITT (*Iowa Sta. Res. Bul. 293 (1941), pp. 409-472, fig. 1*).—"This study has two major purposes: (1) To develop technics for estimating the income-expenditure patterns of farm families over a period of years, and (2) to apply these technics in constructing an income-expenditure pattern for Iowa farm families during a major business cycle." A table shows by the years 1929-39 (1) the incoming payments to Iowa farm families from agricultural products and from off-farm wages; (2) the outgoing payments for rent, feeder stock, wages, seeds, limestone and fertilizer, twine, gasoline, oil and grease, baby chicks, machinery, buildings and repairs, taxes, short-term interest, long-term interest, telephone, electricity, farm organization, consumption, and sales tax; and (3) the short- and long-term capital adjustments. Another table shows the payments made by families as ratios of the expenditures for the same items in 1929, and a third table shows the payments as ratios of the total incoming payments in the same year. The greater part of the bulletin is devoted to a description of the pro-

cedure used in developing each series of estimates. The estimates of income and expenditures cover almost a complete major business cycle and include nearly all income and 80 percent or more of the expenditures.

"Incoming money payments of Iowa farmers in 1932 were only 38 percent of the 1929 level. By 1939, they had increased to 88 percent of 1929. With the sharp drop in income in 1931 and 1932 farmers also reduced expenditures but since 1933 have increased them. Expenditures were reduced far more for some items than for others. Expenditures for fertilizer, machinery, and buildings in 1932 were about 20 percent of those for 1929, while expenditures for taxes, gasoline, telephones, and electricity had dropped only to about 75 percent of those for 1929. Tax and interest payments remained relatively high until 1931, when they dropped sharply as the full impact of the depression hit Iowa agriculture. With higher incomes after 1933, farmers increased some expenditures but not others. In 1939 more was spent for feeder livestock, seeds, gasoline, baby chicks, electricity, and farm living than in 1929, even though income was 12 percent less. This was possible through smaller increases in other expenditures, particularly taxes, buildings, wages to hired labor, and interest on indebtedness, all of which were less than two-thirds of 1929 levels. In recent years the homestead exemption law has reduced expenditures for taxes, while foreclosures, revaluations, and bankruptcies have wiped out much of the interest charges. Heavy expenditures for machinery were made in the last few years, the number of farms served by electricity more than doubled from 1929 to 1939, more gasoline was used for power, and more chicks were purchased from hatcheries. Farm-family living and rent together make up nearly half of the total expenditures of Iowa farmers. Both items showed considerable flexibility over the business cycle, though not as much as income. In 1939 they were as large as in 1929 and hence were a larger part of the total income. There were, of course, more tenants in 1939. The combination of factors as portrayed by expenditures shows sharp contrasts in 1939 compared to 1929, and with it have gone shifts in demand for various factors of production. Clearly Iowa agriculture is continually changing in character."

The significance of reported trends in Louisiana agriculture, T. L. SMITH (La. State Univ.). (*Southwest. Social Sci. Quart.*, 22 (1941), No. 3, pp. 233-241).—The author calls attention to some interpretations of Louisiana census data, the principal one being the reporting of areas tilled by sharecroppers as farms. He concludes that "only farm owners, farm managers, and farm renters should be included in the category of farm operators. The farm 'tenant' who cannot qualify as a renter (standing, share, or cash) should be relegated to the category of farm laborers. The land worked by him should not be counted as a farm."

Farm management in Newberry County, South Carolina, M. J. PETERSON and J. D. KINARD (*South Carolina Sta. Bul.* 338 (1942), pp. 31, figs. 3).—Data covering the entire farm business of 101 farms were collected early in 1940 for the crop year just ended. The physical and economic conditions of the county, land use, fertility maintenance, number of livestock, etc., are described. Analysis is made of the receipts, expenses, and income of farms and factors affecting income—combination of enterprises, size of business, labor efficiency, rates of production, distribution of farm capital, and education of the operator.

"Some of the outstanding features of the successful farms in Newberry County were good balance of enterprises, relatively high labor efficiency, adequate size of business, rates of production of both crops and livestock above the average, and effective distribution of the capital invested in the farm business. Where the physical factors permit and the operator's management ability is adapted,

it appears that the most profitable combination of enterprises is to have livestock, such as dairy cattle, hogs, or poultry, combined with cotton. This type of farming resulted in the largest business, greater efficiency of labor, and provided a distribution of income throughout the year."

A method of estimating the economic effects of planned conservation on an individual farm, A. C. BUNCE and G. W. COLLIER. (Coop. Iowa Expt. Sta.) (*U. S. Dept. Agr., Misc. Pub. 463 (1942), pp. 28*).—"This publication outlines some factors that should be considered and some estimates that should be made in order to determine the probable economic effects of adopting a specific plan of erosion control." It presents a method of making the estimates that may be used by farmers in evaluating the implications of alternate farm plans upon farm income. The method is discussed and illustrated by use of a farm that had adopted a program of soil conservation. No attempt is made to evaluate separately the effect of specific erosion control measures. The subject is discussed under the following headings: Changes in crop production, effect of changes in crop production on the livestock system and farm income, effect of changes in crop production and livestock on the use of labor, cost of achieving control of erosion, estimated capital loss resulting from soil erosion, and the final balance.

A bibliography on the agriculture of the American Indians, E. E. EDWARDS and W. D. RASMUSSEN (*U. S. Dept. Agr., Misc. Pub. 447 (1942), pp. V+107*).—Annotated items included are grouped under the following headings and subheadings: Comprehensive histories; agriculture of the American Indians, including comprehensive references, agriculture of particular regions and tribes, specific crops and animals, and agriculture on Indian reservations in the United States; and uncultivated plants used by the American Indians, including food and industrial plants and medicinal plants.

Agricultural production in New York, 1866 to 1940, T. E. LAMONT (*[New York] Cornell Sta. Bul. 769 (1941), pp. 36, figs. 27*).—This is a revision of Bulletin 693, Agricultural Production in New York, 1866 to 1937 (E. S. R., 80, p. 124).

Foreign Agriculture, [January 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 6 (1942), No. 1, pp. 42, figs. 5*).—Included are the following articles: Sweden Adjusts Its Agriculture to War Conditions, by E. Aberg (pp. 3-14); Wartime Agriculture and Post-War Objectives, by M. Ogdon (pp. 15-32); and Food Consumption in the United Kingdom, by J. H. Richter (pp. 33-42).

Corporate-owned farm land in Minnesota, 1936-1940, A. A. DOWELL (*Minnesota Sta. Bul. 357 (1942), pp. 24, figs. 13*).—The data as to farm real estate held by rural corporations other than the Minnesota Department of Rural Credit were obtained from the files and publications of the Minnesota Agricultural Conservation Committee of the U. S. D. A. Agricultural Adjustment Administration. In the analysis the farms were segregated into the following groups on the basis of corporate type: (1) Federal Land Bank and Federal Farm Mortgage Corporation, (2) Minnesota Department of Rural Credit, (3) joint stock land banks, (4) insurance companies, (5) open and closed banks, (6) trust and mortgage investment companies, (7) educational, religious, and fraternal organizations, and (8) other corporate agencies. The extent of holdings, the variations by type-of-farming areas and by counties, and the holdings by the different types of agencies are analyzed and discussed. The factors responsible for corporate holdings—land values, prices of farm products, crop yields, and price relationships—, the disposal of corporate-owned farms, and the trends in corporate holdings are discussed and described.

The percentage of all farm lands owned by corporate agencies increased from 9.1 percent on January 1, 1936, to 10.4 percent on January 1, 1938, and then declined to 9.9 percent on January 1, 1940. On January 1, 1940, the holdings in the different counties varied from 0.5 percent to 30.9 percent of all land in farms. Life insurance companies owned more land than any other type of corporation. The Minnesota Department of Rural Credit ranked second. Corporate holdings tended to be high in areas where land prices declined most severely prior to acquisition and to be relatively low in areas where the least relative decline had occurred. There was some tendency for corporate holdings to be relatively low in high land value areas and relatively high in low land value areas.

Farm tenancy in California and methods of leasing, R. L. ADAMS and W. H. SMITH, JR. (*California Sta. Bul. 655 (1941), pp. 119, figs. 5*).—"The purposes of this publication . . . are to (1) indicate the extent and trend of farm tenancy in California, (2) point out the usefulness or utility of the practice of leasing, (3) suggest a basis for determining an equitable division of farm income between landlord and tenant, (4) suggest certain items to be considered in drawing up farm leases, and (5) describe leasing methods and practices commonly followed in various sections of California." The method used in the study was largely of a survey nature and much of the analysis is of a descriptive nature. The sections dealing with extent, trends, and distribution of farm tenancy in the State are based largely on reports of the U. S. Bureau of the Census. Those on the utility of farm tenancy, the rental basis, and California leasing practices are based largely on data obtained in field surveys. The most important sources of these data were records of county agricultural conservation associations, the Agricultural Extension Service, banks, loan companies, land companies, buyers of crop and livestock products, etc. These data were supplemented by questionnaires, correspondence, and interviews with over 350 farmers and livestock men. The section dealing with Federal legislation affecting leasing practices in the State is based entirely upon published material of the U. S. D. A. Agricultural Adjustment Administration, supplemented by correspondence with officials of that organization. The section on California farm leasing practices was based on data obtained from 4,377 farm leases and supplementary field investigations in the more important agricultural sections of the State.

The nature and extent of farm tax delinquency in South Carolina, G. H. AULL (*South Carolina Sta. Bul. 337 (1941), pp. 31, figs. 4*).—Data were obtained by trained WPA workers from the county records of all but two counties of the State regarding the ownership and location of each piece of farm property delinquent during the period 1933-37, the acreage and assessed value involved, the amount of taxes levied, and the date of subsequent payment, if any, of the taxes. Using these data and those obtained in a study of farm real estate tax delinquency during the period 1928-32, a study is made of the trends in delinquency as shown by the number of properties and acres delinquent and the total amount of delinquent taxes. Using the data for the 1933-37 period, the frequency of delinquency, the geographic distribution of delinquency in 1937, the characteristics—ownership, size, assessed value, and taxes levied—of delinquent and nondelinquent properties, and the current status of delinquent properties, are analyzed and discussed.

"The study indicates that delinquency has become chronic in the case of many farms and is acute at some time or other on three out of every four of those listed for taxation. The average farm property in the State is delinquent once every 2 yr. Approximately 20 percent of the properties which became delinquent were found in the delinquent column every year, and delinquencies of 1 yr. only occurred in less than one-third of the cases examined."

Approximately 25-30 percent of the taxes becoming delinquent remained unpaid after 5 yr. "For the most part delinquency occurs relatively more frequently on individually owned (as contrasted with corporate-owned) properties, which are of less than average size and of low absolute assessed value. The data suggest, however, that from the standpoint of actual value, delinquent properties are regularly over-assessed—this in spite of the fact that assessments on delinquent properties have been reduced more rapidly in recent years than assessments on other properties. These reductions, however, have been offset in part by higher rates of taxation on delinquent than on nondelinquent properties."

Annual Report of the Manager of the Federal Crop Insurance Corporation, 1941, L. K. SMITH (*U. S. Dept. Agr., Fed. Crop Ins. Corp. Rpt., 1941, pp. 25*).—This report to the Secretary of Agriculture for the fiscal year ended June 30, 1941, "consists of an analysis of the Corporation's activities, an examination of the problems we met and our solution of them, and an explanation of improvements incorporated in next year's program."

Report of the Chief of the Agricultural Marketing Service, 1941, C. W. KITCHEN (*U. S. Dept. Agr., Agr. Market. Serv. Rpt., 1941, pp. 55*).—This report to the Secretary of Agriculture for the year ended June 30, 1941, covers the work of the Service on agricultural statistics; the market news; standards for farm products; inspection, grading, and classification; and regulatory work.

Report of the Chief of the Commodity Exchange Administration, 1941, J. M. MEHL (*U. S. Dept. Agr., Commod. Exch. Admin. Rpt., 1941, pp. 45*).—This report to the Secretary of Agriculture for the fiscal year ended June 30, 1941, discusses the futures markets under the defense program and the general regulatory activities of the Administration. The futures activities in different grains, cotton, wool tops, fats and oils, butter, eggs, potatoes, and different feedstuffs are discussed.

Report of the Administrator of the Surplus Marketing Administration, 1941, R. F. HENDRICKSON (*U. S. Dept. Agr., Surplus Market. Admin. Rpt., 1941, pp. 46*).—This report to the Secretary of Agriculture for the fiscal year ended June 30, 1941, discusses the activities of the Administration under the following headings: Agricultural marketing and distribution programs today, the marketing agreement programs, domestic distribution programs, dealing with specific agricultural marketing problems, and agricultural transportation cases and actions.

The local structure of milk prices in New Hampshire markets, A. MACLEOD (*New Hampshire Sta. Bul. 332 (1941), pp. 60, figs. 13*).—The historical background of milk prices in New Hampshire is sketched briefly. Analysis is made of the prices received at the farm by producers in a typical market (Nashua, N. H.), of producers' prices at varying distances from the market, and of individual producer's prices received within a given distance from the market. The price relationships between different markets of the State are studied. With a view to ascertaining producers' responses to prices, detailed studies were made in the Haverhill and Jefferson areas. In the first area the Boston, Mass., and Manchester, N. H., markets are in competition, and in the second area the Boston and Berlin, N. H., markets. In each case, following a brief historical statement of the price relationships between the Boston and the other market, the factors other than price influencing producers in the choice of a market and the market response of the producers are analyzed and discussed.

The study of the Nashua market showed that prices to producers are not arrived at through any scientific basis and are not those which would be

brought about by perfectly competitive conditions. Between markets of the State, prices varied much more widely than the difference in transportation charges would justify. The factors affecting the market response of producers to varying prices of milk are so many and so varied that no generalizations are possible as to the findings reported.

Egg marketing in the Los Angeles area, H. E. ERDMAN, G. B. ALCORN, and A. T. MACE (*California Sta. Bul. 656 (1941), pp. 91, figs. 30*).—This represents an attempt to ascertain how the Los Angeles egg market works. Studies were made (1) of the way the southern California market is organized to move eggs from producer to consumer, and of the sorts of agencies that handle eggs, the services they perform, and the nature of the competition between them; (2) of the way in which prices are determined, the nature of the price structure, and the way market prices are reported in the Los Angeles market and in certain other markets; (3) of the rate at which quality of eggs declined under conditions somewhat similar to those under which eggs move through the trade channels; (4) of the movement of eggs into and out of the Los Angeles market area and of the way the Los Angeles market is constantly adjusting itself to other markets in the United States; and (5) of the marketing methods found useful in certain other regions to ascertain their adaptability to southern California.

Four different procedures were used. First, representatives of a large number of firms in the egg business were interviewed. Second, price and movement data compiled from State and Federal market news reports were analyzed. Third, several lots of eggs purchased from producers were candled and broken to ascertain interior quality. Fourth, other marketing systems reported in publications and in correspondence with the authors were studied.

What may be done to improve conditions in the Los Angeles market is discussed. Some suggestions are made as to means that might be used to improve the position of poultry producers.

Washington apples on the New York and Chicago fruit auctions, M. T. BUCHANAN (*Washington Sta. Bul. 401 (1941), pp. 55, figs. 13*).—Analysis is made of the volume and prices of Washington apples on the two auctions during the marketing seasons, 1928–29 through 1939–40. The quantities and prices of different varieties, grades, and sizes of apples and the seasonal sales of important varieties are examined and comparisons made between the two markets. For the New York auction comparisons are also made between the important production areas of Washington. The study was based mainly on data obtained from New York Daily Fruit Reporter and from the Chicago Fruit and Vegetable Reporter. Tabulations and data of the U. S. D. A. Bureau of Agricultural Economics and Agricultural Marketing Service, the Washington State Department of Agriculture, and previous studies of the experiment station were also used. In the study of prices, analysis was made for each auction of the differentials for variety, grade, and size.

For the 12 marketing seasons studied the proportion of the annual commercial production of the State sold in the Chicago auction varied from 2.1 to 4.5 percent, averaging 3.6; that on the New York auction from 6.2 to 11.6 percent, averaging 8.6; and that for the two auctions combined from 10.5 to 14.8 percent, averaging 12.2 percent. During the latter part of the period there was a shift from the New York to the Chicago auction in the proportion of apples marketed.

Delicious is the most important variety grown in Washington. Prices of standard Delicious declined rapidly during the period studied relative to the prices of other varieties, and in the later years Winesap and Yellow Newtown apples returned about the same money as Delicious. There was a tendency toward

sales of fewer varieties. In general, medium-sized apples sold for the highest price. Grade as a factor affecting price had about the same effect on both auctions. The highest grade differentials were for Delicious and the next highest for Rome Beauty. The differential was higher for Jonathans on the Chicago auction and for Yellow Newtowns on the New York auction. There was less difference between the prices of different grades of apples when prices were low than when high.

The marketing of Washington apples in Los Angeles, California—Part I, Transportation and wholesale distribution, M. T. BUCHANAN and E. F. DUMMEIER (*Washington Sta. Bul.* 406 (1941), pp. 51, figs. 3).—This is the first of a series of reports analyzing information obtained in a survey conducted during December 1940 to February 1941 of apple marketing in Los Angeles. This report is based mainly on information obtained from railway agents, the Wenatchee Valley and Yakima traffic associations, the U. S. D. A. Agricultural Marketing Service, 30 truckers, 8 brokers, 28 jobbers, and 10 chain store organization headquarters. The methods of transportation, transportation rates, and the comparative advantages of truck and rail transportation are described. The channels of wholesale distribution, point of sale, packs and packages used, condition of apples in the hands of jobbers, brands and advertising and jobber margins, brokerage fees, and other costs of wholesale distribution are discussed. A general discussion of the Washington apple deal includes discussions of "illegitimate marketing," size of apples, prices, competition of Canadian apples, the need of a central marketing agency, storage, and the advantages and disadvantages of the sale of C grade apples.

During 1939 and 1940 approximately 60 percent of all Washington apples sent to Los Angeles were transported by motor trucks. The most important channel of distribution of apples on the Los Angeles market was the packer-shipper, broker, jobber, retailer channel. The total charges per box in January 1941 for transportation and wholesale distribution of Extra Fancy Jonathan apples sold by jobbers to retailers at \$1.87 per box were: Transportation 30 ct., jobber margin 12 percent (22 ct.), and brokerage fee 5 ct. per box.

The world wheat situation, 1940-41: A review of the crop year, H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 18 (1941), No. 4, pp. [2] +109-190, figs. 18*).—War influenced every phase of the wheat situation in 1940-41. It resulted in artificial shortage of wheat in continental Europe and in reduced consumption there. It restricted wheat exports and augmented the wheat surplus carried by the overseas exporting countries. It stimulated many governments to assume full or partial control over wheat supplies, distribution, and prices. Britain's tightened naval blockade in the Atlantic kept overseas wheat from going to the Axis area of the Continent. The overseas exporting countries continued to struggle with the problem of surplus wheat stocks. Australia alone was little troubled, since she had suffered a virtual crop failure in 1940.

Crops and Markets, [December 1941] (*U. S. Dept. Agr., Crops and Markets, 18 (1941), No. 12, pp. 269-328, figs. 4*).—In addition to crop and market reports of the usual types, tables are included showing the acreages, yields per acre and production, total and by States, of different crops in 1940 and 1941 and the average 1930-39. A short article discusses the cost of producing field crops in 1940 and includes tables showing for corn, wheat, and oats the estimated costs of production in 1940 and the estimated cost per bushel on a 10-yr. average yield basis by groups of States, and for cotton the estimated cost of production by selected States and areas for 1940 and the estimated cost per pound of lint on a 10-yr. average yield basis.

RURAL SOCIOLOGY

[Investigations in rural sociology] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 24-27, 65-67, 155-164, 195-201*).—Rural life problems discussed in this report are farm and nonfarm population balance, migration in a defense period, our changing industrial map, coordinating farm with industrial trends, the impact of defense industries on rural communities, hired labor in agriculture, the long-range outlook for agricultural laborers, the post-defense farm-labor problem and the Department's responsibility, emergent groupings in the farm population, an analysis of agricultural census returns, migration and its problems, and aids to farm security, including increasing food production, experience gained in home-stead development, security for farm tenants, camps for migrant workers, medical care for farm families, helping those dispossessed from farms acquired by the Government for defense purposes, and defense employment for farmers.

[**Rural organizations in Wisconsin**], A. F. WILEDEN, F. H. FORSYTH, M. ANDERSON, M. KELLOGG, and D. VORNHOLT. (Coop. U. S. D. A.). (*Wisconsin Sta. Bul. 453 (1941), p. 45*).—A sharp increase is reported in the number of clubs and other special interest organizations in rural Wisconsin during the past 15 yr. Most of the increase has come about in young people's clubs, which have tripled in number, and women's clubs, which have more than doubled.

Community land-use planning committees: Organization, leadership, and attitudes, Garrard County, Kentucky, 1939, H. W. BEERS, R. M. WILLIAMS, J. S. PAGE, and D. ENSMINGER. (Coop. U. S. D. A.). (*Kentucky Sta. Bul. 417 (1941), pp. 141-236, figs. 11*).—Rural people dwell together in neighborhoods and communities that do not necessarily coincide in extent with land-use areas, magisterial districts, voting precincts, postal routes, or school attendance areas. Yet boundaries of the 38 neighborhoods and 9 communities were determined in Garrard County by a relatively simple process of systematic observation described in Part 1.

Part 2 deals with the personnel and activity of the land-use planning community committees and part 3 with the opinions of committee members and non-members on the various questions investigated. In attitude and opinion, the committee member selections differed in general from their neighbors in a more general belief that land use is changing for the better, in more frequent adoption of land-conserving practices at home, in a more usual belief that conservation is profitable, in the thought that governmental agricultural programs have taught conservation, in the feeling that conservation practices would continue after a withdrawal of government payments, in the belief that education makes young people better farmers, in a generally favorable evaluation of extension work and county agent activity, in a relatively more favorable evaluation of the U. S. D. A. Agricultural Adjustment Administration program, and in the more consistent suggestion that rural living levels and rural satisfaction have become somewhat higher and greater during their generation.

After three years: A restudy of the social and economic adjustment of a group of drought migrants, P. H. LANDIS (*Washington Sta. Bul. 407 (1941), pp. 36*).—Continuing this study (*E. S. R., 82, p. 125*), the author concluded that measured by absolute average middle-class standards of living a large proportion of the migrants might be dubbed failures. Contrasted with their past situation in the northern Great Plains preceding their migration the group was making progress—were better satisfied with their present conditions than with their previous ones and planned to remain in the State. Between 1930 and 1940 the percent increase of population in the State of Washington was 11.1 compared with 7.0 percent increase for the United States as a whole.

The resident laborer on the sugar cane farm, H. HOFFSOMMER. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 334 (1941), pp. 50, figs. 3*).—This continues work noted in Bulletin 320 (E. S. R., 84, p. 119).

More than 8 out of 10 of the 1,000 families (exclusive of owners and special workers) living on the 100 farms sampled had the tenure status of resident laborers. Of these, more than three-fourths were colored. A total of 328 families were interviewed, of whom 242 were resident laborers. Of these, 205 reported work during the planting and growing season at an average wage of 96 ct. per day. The average daily earnings for cutting cane were \$1.37. Roughly three-fourths of the resident laborer families reported a gross cash income for the past year, including the contributions of wives and children, of from \$250 to \$500. White families had slightly larger incomes than Negroes, though Negro family members contributed more than white family members. Eighty-one of the resident laborer families had children of from 10 to 15 yr. of age. Of these children, roughly one-half contributed to the family budget, with an average contribution of \$78. White and colored boys contributed with about the same relative frequency, but the colored boys contributed greater amounts. All of the girl contributors were colored.

Resident laborers moved rather infrequently, the average length of residence on the present farm being 13 yr. and the average number of farms lived on since working for themselves as apart from their parents being 2.5. The resident laborer belongs to a relatively fixed tenure class. Of 280 heads of families who started out as laborers, nearly 8 out of 10 still remained laborers. Eight out of every 10 resident laborers received as perquisites a house, garden space, wood, and a team for hauling the wood. Nine out of 10 of the resident laborers, croppers, and tenants received credit advances. Seven out of 10 of the tenants and croppers had glass windows in their houses, as compared with 3 out of 10 for the resident laborers. Two out of 10 of all houses had some screening. Among the houses for colored families, less than 1 out of 10 had screening.

The most commonly found laborer house consisted of two rooms, with three-, four-, and five-room houses next in order of frequency. Sharecropper and tenant houses averaged larger than laborer houses. Fourteen percent of the households reported ice boxes and phonographs, 5 percent radios, 4 percent electricity, and smaller percentages running water, bathtubs, telephone, and daily and weekly papers.

Church attendance was by far the most important formal community activity, more than 9 out of 10 of the tenants, croppers, and laborers stating that members of their families participated. More than 6 out of 10 of all families had members belonging to lodges. Less than 2 out of 10 reported members attending picture shows. Less than a third of the white and only 3 percent of the colored laborers reported attending dances.

Some contrasts in women employed in two types of industries in Mississippi, D. DICKINS. (Miss. Expt. Sta.). (*Social Forces, 19 (1941), No. 4, pp. 522-532*).—This report concerns the status of white women employed in five industrial plants of Mississippi (three cotton textile mills and two cotton garment plants), all located in poor agricultural areas of the State, and includes their ages, schooling and occupational experience, occupation of families in which reared, marital status and residence, number of children and care during mothers' working hours, housekeeping arrangements, home duties of housekeeping and nonhousekeeping women, and difference in women in the two industries.

FOODS—HUMAN NUTRITION

The progress of nutrition knowledge (*U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 71-79*).—This brief account points to practical implications of the work of the Bureau of Home Economics (E. S. R., 86, pp. 700, 716).

The nutrition campaign (*U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. 67-71*).—This is a brief account of the part taken by the Department in formulating a food policy for the present emergency and in putting it into action.

[Food and nutrition studies by the Georgia Station] (*Georgia Sta. Rpt. 1941, pp. 125-128*).—This report (E. S. R., 84, p. 122) notes progress in the study of the effect of environmental conditions on the ascorbic acid and mineral content of turnip greens and the mineral content of cowpeas grown in two or three areas in the State, as part of the project on the composition of vegetables grown in the South carried on cooperatively with five other Southern States and the U. S. Department of Agriculture. Progress is also reported on work concerning factors affecting the ascorbic acid content of tomatoes, and factors influencing the utilization of calcium by the animal body, including data on the calcium oxalate content of New Zealand spinach.

[Nutrition studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 453 (1941), pp. 24-31*).—This report of progress in studies, many of which have been reported elsewhere, on animal nutrition and food values summarizes findings indicating that animals may synthesize some vitamins (S. Black and C. A. Elvehjem); vitamin E keeps carotene from oxidizing (F. Quackenbush, R. P. Cox, H. Gottlieb, and H. Steenbock); ethanalamine intensifies kidney hemorrhage in rats (R. Johnson, C. R. Thompson, Quackenbush, and Steenbock); a fourth factor, in addition to linoleic acid, pyridoxin, and pantothenic acid, is necessary to cure rat acrodynia (Quackenbush, F. Kummerow, D. Anthony, and Steenbock); meat contains its share of vitamins (L. M. Henderson, J. M. McIntire, and Elvehjem); pantothenic acid is distributed in various natural sources (A. Earle, C. Peters, and F. Strong); phosphorus in milk is highly available to the animal (R. Bunkfeldt and Steenbock); a large part of the thiamin and nicotinic acid content of wheat is removed in the milling of white flour (L. J. Teply, Strong, and Elvehjem); 1-2 mg. of riboflavin daily is not enough to meet the human requirement (H. Parsons, M. Reynolds, B. Moore, D. Williams, Strong, and R. Feeney); egg white may bind more than one vitamin (Parsons, M. Johnson, and D. Anderson); hydrolysis improves the quality of soybean protein (Parsons and C. Walliker); and "salty soys" prepared by soaking the soybeans before deep-fat frying are a good source of protein in the human diet (Reynolds, M. Primrose, and M. Rohde).

Food composition tables, H. R. MARSTON and M. C. DAWBARN (*Austral. Council Sci. and Indus. Res. Pam. 107 (1941), pp. 36, figs. 3*).—This compilation, prepared in response to the request for information as to the composition of foodstuffs suitable for use in army rations, was based on data from a large number of original scientific communications, the values having been selected with due consideration of the methods employed for the chemical analyses and for the bio-assays utilized in the assessment of the various constituents. In the case of the vitamin data in particular, "only those assays which have been conducted by methods which are reasonably capable of yielding reliable data have been accepted." These methods are outlined briefly. The graph for the composition of beef was drawn up from information from American sources, but the similar graph for the assessment of the composition of mutton was based upon determinations made on Merino carcasses in the nutrition laboratory of the Council for Scientific and Industrial Research, Australia.

The tables are prefaced by brief discussions concerning the energy, protein, mineral, and vitamin requirements of man, and the general nutritional contribution of breadstuffs and meats. The food composition tables give data on the percentage of proximate constituents and minerals, and on the calorie and vitamin values per pound of the edible portion (percentage on the as-purchased basis indicated) of all foods. Vitamins A, B₁, riboflavin, and C, and among the minerals, the calcium, total and available (ionizable) iron, and total and available (non-phytic) phosphorus, are considered.

Effect of various concentrations of papain and potassium iodate on the loaf volume of bread, J. DAVIDSON and J. A. LECLERC. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 3, pp. 145-152, figs. 3).—"The results of baking tests show that there is a consistent interaction between various concentrations of papain and potassium iodate in their effect on the loaf volume of bread. When added singly, some concentrations of potassium iodate and papain depress the loaf volume of bread, the extent of depression being directly related to the concentration. When added together, certain of these concentrations counteract each other. While papain stimulates diastatic activity and potassium iodate depresses it, the action of these substances on the loaf volume of bread cannot be ascribed to their effect on the diastatic power of the flour since sodium chloride, which is always used in bread baking, also stimulates diastatic activity, yet causes no depression in loaf volume."

The nutritive value of some Tanganyika foods.—II, Cassava, W. D. RAYMOND, W. JOJO, and Z. NICODEMUS (*East African Agr. Jour.*, 6 (1941), No. 3, pp. 154-159).—Based upon analyses presented, the following figures for the composition of fresh peeled cassava root are suggested for use in dietary calculations: Moisture 62 percent, protein 0.7, fat nil, and carbohydrate 30 percent. Analyses showed the calcium content to vary from 31.26 to 51.35 mg. per 100 gm. of fresh peeled root, phosphorus from 104.6 to 199.5, and iron from 0.18 to 0.37 mg. Determinations of ascorbic acid gave values from 30.9 to 54.6 mg. per 100 gm. for 4 samples of raw peeled root and from 12.3 to 52.4 (average 29.3) mg. for 91 varieties of raw whole roots. The skin was less rich in ascorbic acid than the edible peeled roots; these latter when boiled lost about half of their ascorbic acid, but roasting caused only slight loss. Cyanogenetic glucosides present in appreciable quantities in the raw roots were destroyed upon cooking. The leaves, analyzed without leaf stalk, were very rich in ascorbic acid, containing from 325.6 to 381.4 (average 353.2) mg. per 100 gm. when freshly picked. Storage at tropical room temperatures caused rapid and pronounced losses of ascorbic acid, the leaves containing but 75.1 mg. of ascorbic acid per 100 gm. after 1 day and only 37.5 mg. after 3 days of storage. The carotene content of the leaves varied from 9,746 to 11,136 μ g. per 100 gm. in the fresh state. Losses of vitamin C and carotene upon cooking (boiling until tender in a small amount of water) were slight, but the cyanogenetic glucoside present in the raw leaves was destroyed upon cooking. Determination of phosphorus, calcium, and iron in the leaf blade gave values of 0.098, 0.187, and 0.003 percent, respectively. Oxalic acid in the leaves was high, averaging 108.9 mg. per 100 gm. Juice extracted from the fresh leaves and concentrated in vacuum gave a preparation that kept well and that contained upwards of 2,000 mg. of ascorbic acid per 100 gm.

Biological values of soybean protein and mixed soybean-pork and soybean-egg proteins in human subjects, L. T. CHENG, H. C. LI, and T. H. LAN (*Chin. Jour. Physiol.*, 16 (1941), No. 1, pp. 83-89).—The results of nitrogen balance studies conducted by the Mitchell method (E. S. R., 51, p. 407) on three human subjects are reported. During the test period the three subjects received diets containing 2.6 percent of protein, which supplied about 4 percent of the calories,

as furnished, respectively, by soybean curd, a mixture of 3 parts of pork protein and 7 parts of soybean protein, and a similar mixture of egg and soybean proteins. The digestibilities of these several proteins were found to be 97, 96, and 94 percent, respectively, and the biological values 64, 67, and 77, respectively.

Biological values of proteins in watermelon and pumpkin seeds, T. E. KING (*Chin. Jour. Physiol.*, 16 (1941), No. 1, pp. 31-35).—The Mitchell nitrogen balance method (E. S. R., 51, p. 407), applied to the proteins of watermelon and pumpkin seeds at a 10-percent level of intake, gave results indicating digestibilities of about 92 percent and biological values of the proteins of 73 and 63, respectively.

Poultry cooking, L. M. ALEXANDER (*U. S. Dept. Agr., Farmers' Bul.* 1888 (1941), pp. II+33, figs. 31).—Cook at moderate heat, and vary the cooking method according to the age and fatness of the bird—these are given as the two rules of modern poultry cooking. The methods, including broiling, frying, roasting, braising, stewing and steaming, and the cooking of smoked turkey, are given, together with a guide to quantities and recipes, including those for stuffings and for favorite chicken combinations, and suggestions for carving.

Annual review of physiology, III, edited by J. M. LUCK and V. E. HALL (*Stanford University, Calif.: Amer. Physiol. Soc. and Annual Rev., Inc.*, 1941, vol. 3, pp. VIII+784).—Among the 26 reviews comprising this annual publication (E. S. R., 86, p. 123), the following deal with topics of special nutritional significance: Developmental Physiology, by E. Witschi (pp. 57-78); Growth, by C. E. Palmer and A. Ciocco (pp. 79-106); Energy Metabolism, by T. M. Carpenter (pp. 131-150); The Digestive System, by J. E. Thomas (pp. 233-258); Liver and Bile, by W. B. Hawkins (pp. 259-282); Formed Elements of the Blood, by G. M. Higgins (pp. 283-312); Endocrine Aspects of the Physiology of Reproduction, by O. Riddle (pp. 573-616); and Reproduction in Mammals, by M. H. Friedman (pp. 617-642).

Anthropometric data on college women of the Middle States, E. G. DONELSON, M. A. OHLSON, B. KUNERTH, M. B. PATTON, and G. M. KINSMAN. (Minn., Iowa, Kans., Ohio, and Okla. Expt. Stas. and Kans. State Col.). (*Amer. Jour. Phys. Anthropol.*, 27 (1940), No. 3, pp. 319-332).—"Anthropometric measurements of 1,013 college women from the States of Iowa, Kansas, Minnesota, Ohio, and Oklahoma are reported. The measurements taken were [chosen primarily for the purpose of indicating the nutritional status of the individual and included] height, weight, chest breadth (lateral), chest depth (anteroposterior), girth of the arms and left leg, and pressure of the right and left hands. There were 437 Old Americans [persons whose ancestry has been American for at least three generations] observed. Seventy-eight percent of the Oklahoma students were Old Americans, 62 percent of the Ohio group, 45 percent of those from Kansas, 27 percent of the Minnesota group, and 21 percent of the Iowa students. The means for the Old Americans were slightly smaller for all measurements than the means for those not classed as Old Americans, with the exception of the chest breadth and depth which were no different; the girth measurements were significantly smaller. The measurements, ranked according to degree of variability expressed by the coefficient of variation, follow in increasing order of magnitude: Height, chest breadth, chest depth, leg girth, arm girths, weight, and pressure. The measurements for height, weight, girth of right arm, and leg circumference show a small consistent increase with ages 17, 18, and 19 yr. The women measured for this study excel in height and weight previously measured college women from the respective States. The chest diameter measurements, although of a magnitude similar to earlier measurements on college women, were exceeded slightly by Hrdlička's measurements of Old Americans.

The pressure force measurements varied between States, but all exceeded that determination by Hrdlička for adult Old Americans."

Width-weight tables (revised), H. B. PRYOR (*Amer. Jour. Diseases Children, 61 (1941), No. 2, pp. 300-304, fig. 1*).—Revised width-weight tables differ from the earlier ones chiefly in taking into consideration lateral measurements of the chest, as well as biiliac diameters. The method of developing the tables is described, and the resulting tables for 15-year-old girls are presented to illustrate their use.

Physical measurement of young children, V. B. KNOTT (*Iowa Univ. Studies Child Welfare, 18 (1941), No. 3, pp. 99, figs. 15*).—In this investigation of the reliability of anthropometric measurements of children of preschool age, 35 physical measurements were obtained on 131 children between 3 and 6 yr. of age. For most of the measurements each child was measured separately by two technicians, and for five of the measurements two observations by the same technician were secured. The data analyzed included 3,643 differences between the independent observations of the two technicians and 221 differences between the two observations by the same technician.

The report includes chapters on the relation of anthropometric reliabilities to the scientific study of physical growth; the literature dealing with the reliability of the measurements; aims, material, and method of analysis; separate chapters dealing with the reliability of measurements of length, transverse and anteroposterior diameters, girths, and skin and subcutaneous tissue; reliability of measurements in relation to their magnitude and rate of growth; and a final chapter presenting a summary and conclusions.

Of special interest are the author's estimates of the approximate frequency of measurement considered profitable during the preschool years. These include stature 10 times a year; hip width, sitting height, leg girth, and total arm length from 3 to 4 times a year; head, chest depth, and elbow width every 2 yr.; and the remaining measurements chiefly once a year.

The blood sedimentation rate in healthy girls, L. BENSON and E. J. ROGERS. (*Univ. Vt.*). (*Jour. Lab. and Clin. Med., 26 (1941), No. 6, pp. 987-989*).—Blood sedimentation rates, determined by the Cutler method, are reported for 327 presumably healthy girls, all of whom were known not to have been ill at any time within 4 mo. after the blood was withdrawn for the original tests. Ninety-two percent of the girls had rates between the limits of 2 and 13 mm. per hour, whereas the rates of 8 percent of the girls ranged from 14 to 25 mm. per hour. The median fell at 7 mm. "This study suggests that in young women the blood sedimentation rate is variable, and that about 10 percent of healthy young women may have sedimentation rates of greater velocity than the average arbitrary range. The diagnostic value, therefore, of the erythrocyte sedimentation rate must be guided by these normal variations."

Measure of metabolic speed in children, M. TOBIAS and L. STOCKFORD (*Amer. Jour. Diseases Children, 61 (1941), No. 4, pp. 675-686*).—Data obtained in routine pediatric practice, concerning metabolic rate, total serum cholesterol, and carpal development (bone age), were used in this study. The subjects, selected at random as ones for whom two or more of these measurements had been made, represented clinically constitutionally inadequate children and included 125 boys and 91 girls. These children ranged from 1 to 14 yr. in age. Correlations of the accumulated data were made by the Pearson product-moment method in order to establish the relative validity of each procedure as a measure of metabolic speed. No significant relation was demonstrated between age and sex and the three measures of metabolic speed. The data, analyzed according to the interrelations of the three measures, showed that "the assessment of

delay in carpal development is not a measure of 'slow metabolic speed.' Determination of the level of total cholesterol is a simple and valid measure of a low level of maintenance basal metabolic rate activity in children. Determinations can be satisfactorily accomplished for children beyond the age of 2 yr. When the basal metabolic rate is within the so-called normal limits of +10 and -10 percent, its normalcy must be authenticated by measures of both the total cholesterol and the skeletal development. Determinations of basal metabolic rate are less reliable than are determination of total cholesterol as measures of slow metabolic speed."

Clinical appraisal of growth in children, J. D. BOYD (*Jour. Ped.*, 18 (1941), No. 3, pp. 289-299, figs. 5).—The fallacy of attempting to appraise the growth of individual children by comparison with standard height-weight-age tables is discussed, with illustrative growth curves from the author's experience and the literature. Practical recommendations are given as follows:

"In each physical examination of the infant or child, include records of certain specific measurements and data regarding the rate and degree of growth and development. Appraise these against available standards of normality. Do not assume with finality that the child who falls within these standards is developing as well as he may be able to do under improved circumstances. When the infant or child falls below such standards, do not explain away his status without assuring yourself that correctable abnormality of body or of manner of life is not present. Finally, accept standards of growth and development for what they are—cross-sectional averages of children from diverse groups and of varied levels of health—rather than ideals of achievement."

Nutritional status of school children in a small industrial city, S. L. ZAYAZ, P. B. MACK, P. K. SPRAGUE, and A. W. BAUMAN. (Pa. State Col. et al.). (*Child Devlpmt.*, 11 (1940), No. 1, pp. 1-25, figs. 13).—In this comparison of the dietary habits and nutritional status of 428 school children in an industrial city of about 82,000 population where low incomes prevail, the families were arbitrarily grouped in five income classes from class A of \$5,000 annual cash income and above to class E on direct Government relief, and also in five education level groups from class A with all adults college graduates to class D with no adult a high school graduate. The dietary habits were estimated in terms of weekly intakes of the principal food groups from records kept by some adult in the family of the food consumption of each child during a typical three-meal week day and similar records kept by the child for 2 days. Nutritional status was evaluated from nine tests as described by Mack and Smith (*E. S. R.*, 82, p. 130).

The weekly average intakes of the various types of foods, grouped by income classes, showed a decrease from higher to lower incomes in the consumption of milk, meat, eggs, citrus fruits, and green vegetables; little or no difference between C and D and E combined in yellow vegetables, tomatoes, and bread; and a higher consumption of fruit other than citrus in C than in the other two groups. An association between family income and response to the nutritional tests was evident in physical examination, skeletal status, hemoglobin, and dark adaptation but not for the other factors. The same tendencies were shown in comparisons with the educational status.

The school lunch as a supplement to the home diet of grade school children, M. E. LOWTHER, P. B. MACK, C. H. LOGAN, A. L. O'BRIEN, J. M. SMITH, and P. K. SPRAGUE. (Pa. State Col.). (*Child Devlpmt.*, 11 (1940), No. 3, pp. 203-247, figs. 5).—In this investigation in which the authors had the cooperation of J. J. Shaw and P. Dodds, the procedures outlined by Mack and Smith (*E. S. R.*, 82, p. 130) were followed in the appraisal of the nutritional status

and dietary habits with relation to socioeconomic status of 225 grade school children chosen from two communities described in the report of Zayaz et al. noted above in such a way as to represent the family cash-income distribution of the school children in the combined communities.

Analysis of the dietary records showed that energy intake tended to fall slightly with descending classes, protein declined gradually, calcium sharply, phosphorus less abruptly than calcium, iron gradually, vitamin A abruptly, vitamin B₁ and riboflavin gradually. The vitamin C intake equaled or exceeded the U. S. D. A. Bureau of Home Economics standards (E. S. R., 81, p. 142) in all groups but C. A similar distribution of nutritional status ratings led to the conclusion that "both the responses to the nutrition tests and the analysis of the dietary intakes of the children clearly indicate the need for improvement in nutritional status of a considerable proportion of the children in all socioeconomic groups, with this need becoming more acute as the socioeconomic level becomes lower."

The preparation of a casein hydrolysate for the study of the relationship between choline and homocystine, A. D. WELCH (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 173-181, fig. 1).—Hydrolysis of casein with concentrated hydriodic acid, by the method described, resulted in a mixture of amino acids grossly deficient in methionine, homocystine, homocysteine, and tryptophan, as indicated by growth tests with rats fed the casein hydrolysate with and without these amino acid supplements in an otherwise adequate diet. The casein hydrolysate is recommended as a relatively inexpensive substitute for mixtures of purified amino acids for the study of the relationship between choline and homocystine. The need for choline (or betaine) in order to enable the rat to utilize the homocystine for growth, and the ineffectiveness of the arsenic analog of choline chloride in this respect were demonstrated in confirmation of these discoveries by Du Vigneaud et al. (E. S. R., 84, p. 274). The lower homolog of methionine, S-methylcysteine, the β -methyl derivative, and the methyl-diethyl homolog of choline chloride were also ineffective in inducing growth on a diet containing homocystine in place of methionine.

Choline metabolism.—V, The effect of supplementary choline, methionine and cystine and of casein, lactalbumin, fibrin, edestin, and gelatin in hemorrhagic degeneration in young rats, W. H. GRIFFITH (*Jour. Nutr.*, 21 (1941), No. 3, pp. 291-306, figs. 3).—In continuation of the series (E. S. R., 86, p. 275), the occurrence and severity of hemorrhagic degeneration in rats fed 25 diets differing in protein content from 18 to 40 percent, in total methionine from 0.4 to 1.2 percent, and in total cystine from 0.05 to 1.2 percent were determined, using as the proteins casein, lactalbumin, fibrin, edestin, and gelatin. As further indices of the degree of choline deficiency, increases in the weight of the kidneys and in the extent of deposition of fat in the liver were determined.

Renal damage was found not to be proportional to the cystine content of the diet in the amounts fed (0, 0.3, 0.5, and 1 percent), and the minimum daily requirement for choline was the same at these various levels. However, the higher cystine levels had a slightly more toxic effect in the absence of added choline. Casein was the most protective of the proteins used, and lactalbumin, fibrin, edestin, and gelatin aggravated the effects of choline deficiency, presumably because these proteins contained less methionine and more cystine. Hemorrhagic degeneration was absent or nearly so in each group receiving more than 8 mg. of methionine per gram of food. Under these conditions choline did not appear to be essential. With lesser amounts of methionine the renal lesions and fat deposits varied according to the methionine and

cystine levels. The choline requirement varied inversely with the dietary methionine and directly with the dietary cystine.

In discussing the significance of these findings, the author points out that "the prevention of hemorrhagic degeneration in young rats is a relatively sensitive test for those metabolites which may supply methyl groups for the synthesis of choline."

Cocarboxylase, pyruvic acid, and bisulfite-binding substances in children, H. WORTIS, R. S. GOODHART, and E. BUEDING (*Amer. Jour. Diseases Children*, 61 (1941), No. 2, pp. 226-230).—The subjects of this study were children hospitalized because of conduct disorders, behavior problems, psychoneuroses, and mental deficiency, but showing none of the recognized signs of vitamin B₁ deficiency or conditions which might be expected to produce a vitamin B₁ deficiency.

Blood cocarboxylase values for 50 children from 4 to 15 yr. of age ranged from 4 μ g. (2 subjects) to 13 μ g. (1 subject), with an average of 7.5 ± 1.82 μ g. per 100 cc. For the 24 children who were 12 yr. of age or over the average was 6.5 ± 1.38 , and for the 26 under 12 yr. of age 8 ± 2.06 μ g. per 100 cc., as compared with an average of 7.0 ± 2.1 μ g. per 100 cc. reported by Goodhart and Sinclair (*E. S. R.*, 83, p. 420) for a group of adult subjects. A trend toward higher values in young children is suggested. Blood pyruvic acid values for 35 children between 7 and 16 yr. of age ranged from 0.71 to 1.21, with an average of 0.96 mg. per 100 cc., and for 60 adults from 17 to 70 yr. of age from 0.77 to 1.16, with an average of 0.98 mg. Values for the cerebrospinal fluid for both children and adults were in practically the same range. Bisulfite-binding substances in the blood of 93 children from 3 to 16 yr. of age ranged from 2.0 to 4.9, with an average of 3.55, and in cerebrospinal fluid from 0.42 to 1.79, with an average of 1.24 mg. per 100 cc. Corresponding values for 105 adults from 17 to 70 yr. of age were blood from 2.00 to 5.72, with an average of 3.84, and cerebrospinal fluid from 0.42 to 3.07, with an average of 1.63 mg. per 100 cc., respectively. It is reiterated (*E. S. R.*, 84, p. 705) that the value of bisulfite-binding substances in blood and cerebrospinal fluid cannot be used as an indication of vitamin B₁ deficiency or as an accurate measure of the levels of pyruvic acid in these fluids.

Cocarboxylase content of blood of infants and of children, F. W. SCHLUTZ and E. M. KNOTT (*Amer. Jour. Diseases Children*, 61 (1941), No. 2, pp. 231-236).—A series of blood cocarboxylase values determined by the method of Goodhart and Sinclair (*E. S. R.*, 83, p. 420), with a few modifications, is reported for healthy and ill infants and children, and a few women in labor and during lactation, with in some instances values for the same subjects following thiamin therapy.

Well-nourished subjects in general had values of 10 μ g. or above per 100 cc. and chronically and acutely ill subjects lower values. Thus, an apparently healthy breast-fed infant 10 weeks of age gave a value of only 7.0 μ g. per 100 cc., which increased to 14.7 μ g. after the mother's diet had been supplemented with 500 International Units of thiamin chloride daily. Two healthy infants of the same age, hospitalized for metabolism studies and receiving the same type but not the same quantities of food (breast milk and evaporated milk formulas), were tested at frequent intervals from 7 to 20 weeks of age. The larger of the two maintained a fairly constant cocarboxylase level of about 12 μ g. per 100 cc., while the values for the other gradually decreased from 10.8 to 8 μ g. per 100 cc. At a level of 9.2 μ g. symptoms of slight vitamin B₁ deficiency were evident. Final cocarboxylase levels of 13.1 and 10.1 μ g. per 100 cc., respectively, were obtained following the fortification of the milk formula with vitamin B₁, 133 I. U. of thiamin chloride being used daily in the second case. Three women in labor had values

of 8.7, 8.9, and 8.6 $\mu\text{g.}$ per 100 cc.; during lactation on a regular diet 4.9, 10.3, and 13.8 $\mu\text{g.}$; and on a regular diet supplemented with 500 I. U. of thiamin chloride daily 11.3, 11.1, and 23.0 $\mu\text{g.}$ per 100 cc. daily.

In the opinion of the authors cocarboxylase determinations give a reliable estimate of the thiamin content of vital fluids, especially the blood, and should be of aid in detecting subclinical vitamin B₁ deficiency.

The formation of pyruvic acid following ingestion in man, E. BUEDING, M. H. STEIN, and H. WORTIS (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 793-794).—In 21 experiments on 17 healthy, well-nourished subjects, glucose and pyruvic acid were determined in the blood under basal conditions, following which glucose at the level of 1.75 gm. per kilogram of body weight was ingested in 25 percent solution. Blood pyruvic acid was determined by the method of Bueding and Wortis (*E. S. R.*, 85, p. 852) at 30- to 60-min. intervals over a period of from 4 to 6 hr. The maximum rise usually occurred at the end of 1 hr. (30 min. in one case) and ranged from 0.14 to 0.93 mg., averaging 0.43 mg. per 100 cc. Following the peak, the level fell to normal at or before the third hour in all but one case. "These observations indicate either (1) that pyruvic acid is a normal intermediary in the metabolism of glucose in man, or (2) that the ingestion of glucose by mouth stimulates the formation of pyruvic acid in some other way."

The absorption and fate of free citric acid in the rat, C. A. KUETHER and A. H. SMITH (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 647-658).—Citric acid at the level of 100 mg. per 100 gm. of body weight was administered in 10 percent solution by stomach tube to fasting rats. The amount remaining in the gut after $\frac{1}{2}$, 1, 2, 3, and 5 hr. was determined in animals sacrificed at these intervals. The amount of citric acid absorbed was calculated as the difference between the amount administered and that recovered minus the amount present in the fasting gut, as determined in a separate control group. Other experiments showed that the stomach and small intestines and their contents upon ligation and removal from the rat did not destroy the citric acid then injected into the stomach, when the whole was incubated in Tyrode's solution for 5 hr. This evidence indicated that the orally administered citric acid was probably not destroyed by bacteria or enzymes present, and that the amount that disappeared from the gut was truly absorbed.

Data on the absorption of citric acid showed that under the conditions of the experiment about 90 percent was absorbed within 5 hr., with the rate of absorption greatest for the short intervals and decreasing as the period was lengthened. This suggested that the rate of absorption was proportional to the amount of material in the gut. Glycogen, determined in all livers following the administration of citric acid to the rats, increased from the $\frac{1}{2}$ -hr. period, with a peak at 3 hr., after which the concentration decreased. The rise and subsequent fall were interpreted as probably indicative of two opposing tendencies, synthesis and hydrolysis of glycogen. During the earlier periods the rate of synthesis was the greater, resulting in an increase in glycogen, but in the later periods, with decrease in rate of synthesis as the absorption rate decreased and with continuing hydrolysis, the net result was a decrease in liver glycogen. The quantitative data for citric acid absorbed and glycogen formed suggested a mole for mole relationship.

The calcium content of the normal growing body at a given age, K. E. BRIWA and H. C. SHERMAN (*Jour. Nutr.*, 21 (1941), No. 2, pp. 155-162).—To find whether it is age or the individual rate of growth which determines the percentage of calcium in the normal animal, the percentage of body calcium was determined in over 400 rats from a long-established stock colony, selected for analysis at the age of 28 days or the "end of infancy." Animals were taken from families on

three dietaries based on two-thirds ground whole wheat and one-third dried whole milk, but differing in calcium supplements so that dietary calcium was 0.35, 0.49, and 0.64 percent in the three diets, respectively. The results of the analyses of the animals of the six series (each sex from each of the three family diets) were studied statistically for possible influence of body size at the given age.

In none of the six comparisons did the heavier animals show a significantly higher percentage of body calcium than the lighter animals, as would be the case if higher body weight meant greater maturity of skeletal development at the age studied. Comparisons of animals grouped as large, medium, and small showed slightly higher percentages of calcium in the small and slightly lower percentages in the large animals than in those of medium size representing the average for their age, sex, and nutritional background. These differences were so small, however, that none were statistically significant. It is concluded, therefore, that "among normal growing individuals of a given sex, having the same hereditary and nutritional background, age is the predominant determining factor in the increasing percentage of calcium in the body."

Influence of different nutritional conditions upon the level of attainment in the normal increase of calcium in the growing body, C. S. LANFORD, H. L. CAMPBELL, and H. C. SHERMAN (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 627-634).—Purebred albino rats from a long established colony received the basic diet composed of one-third whole milk powder, two-thirds ground whole wheat, and salt to the extent of 2 percent of the wheat. This diet, containing from 0.34 to 0.35 percent of calcium, was better balanced and of higher protein and initial calcium content than the diet previously used in a similar study (*E. S. R.*, 81, p. 451). One group received only the basal diet, while the others received this diet supplemented with calcium carbonate to bring the calcium levels to 0.48 and 0.64 percent, respectively. Animals at 28, 60, 90, and 180 days and 1 yr. of age were selected for analysis from second and third generations of each of these three dietary families. Net body weight (gross body weight less weight of the gastrointestinal contents) and the weight and percentage of body calcium are reported for males and females separately as averages for animals in each age group in each dietary family. The data, analyzed for statistical significance, showed that increasing the calcium content of this superior diet resulted in successive increases in percentage of body calcium at a given age, the difference induced by each stepwise increment being one-tenth to one-twelfth at the period of most rapid growth and about one-thirtieth at full maturity. Rats on the highest level of calcium intake attained at the age of 2 mo. a percentage of body calcium (0.80 percent) which those on the diet with 0.35 percent calcium required 50 days more to attain. At 28 days of age only a low degree of association existed between degree of calcification and body size, this finding being in agreement with that of Briwa and Sherman as noted above. For later ages, however, the data indicated that greater than average body weight tended to be accompanied by lower than average percentage of body calcium and vice versa. This interrelationship appeared to be at least as marked at the more liberal as at the lower levels of calcium intake and at least as marked at full maturity as during rapid growth.

The changes in composition of solutions of calcium chloride and calcium lactate in the intestine, C. S. ROBINSON, D. E. STEWART, and F. LUCKEY (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 283-292, fig. 1).—The present study, representing an extension of earlier work (*E. S. R.*, 73, p. 718) dealing with the regulation and changes in intestinal reaction, is concerned with detailed experimental analysis of changes in water content and in H-ion, cation, and anion concen-

trations in perfused intestinal loops of dogs with Thiry-Vella fistulas. The experiments, which are described, involved the establishment of the fistula and, after healing of the ends, circulation of solutions of calcium chloride and calcium lactate of known composition for 3 hr. without change in pressure. At the end of the period the solutions were analyzed. The changes in composition indicated that concentrated acid solutions of calcium chloride yielded the most calcium to the body, but that acidity did not increase absorption of calcium from lactate solutions, although increase in concentration did increase the amount absorbed. Hence, the particular salt involved, as well as the concentration and acidity of the solution, were of importance in determining the amount of calcium absorbed. Alkaline solutions quickly became acid, partly by an influx of CO_2 . Water and salts passed in either direction through the intestinal wall to alter the osmotic pressure of the intestinal contents. The acidosis of calcium chloride was apparently not caused by selective absorption of chloride ion from the intestine, but by displacement of other cations by calcium whose subsequent excretion caused a deficit in total cations.

Red cell volume circulating and total as determined by radio iron, P. F. HAHN, W. M. BALFOUR, J. F. ROSS, W. F. BALE, and G. H. WHIPPLE (*Science*, 93 (1941), No. 2404, pp. 87-88).—Radioactive iron given by mouth or vein to anemic dogs was found to be rapidly used up in the construction of new hemoglobin within newly formed red cells (E. S. R., 85, p. 418). In the study here reported red cells containing the radio iron were given by vein to eight dogs, six of which were normal, and the degree of dilution noted after varying periods allowed for mixing of the ordinary and labeled red cells. The true circulating red cell volume determined by this method averaged about 75 percent of the value as computed from the jugular hematocrit and the plasma volume (dye method), indicating an inherent error of about 25 percent in this latter method. The red cell volume measured by dilution of the injected labeled red cells was almost the same after 10 min. as after from 1 to 3 days, average differences between the two values amounting to only 3 percent. This indicated that in these normal dogs the number of immobilized red cells in marrow, spleen, and other vascular spaces did not exceed 10 percent of the circulating mass and may have been considerably less. It is suggested that this method can be used to study human physiology, normal and abnormal.

Sensitivity of the dark-adapted eye during a prolonged period of observation, B. SEMEONOFF (*Nature [London]*, 147 (1941), No. 3728, pp. 454-455, fig. 1).—In this study, undertaken to determine if the course of dark adaptation is affected by fatigue, a single subject trained in adaptation tests underwent two tests during periods of 6 hr. from 10 or 10:30 p. m. to 4 or 4:30 a. m. after an ordinary day's activity followed by 3 hours' fire-watching duties. In the first test adaptation was carried out in complete darkness and in the second in diffuse red light bright enough to read by with difficulty. The Nagel adaptometer was used, and readings were taken following 10 min. of preliminary light adaptation, and then at intervals of 5 min. during the entire 6 hr. No significant differences were found in the readings with prolongation of time in either test. This indicates that at least for the trained subject ordinary fatigue at the end of a normal day's sedentary work has no effect on the adaptation process as a measure of the maximum level attained, and suggests that it is possible to maintain accurate observations in the dark-adapted state during a protracted period of enforced wakefulness.

A survey of nutrition and dental caries in 120 London elementary school children, I. ALLEN (*Brit. Med. Jour.*, No. 4175, (1941), pp. 44-46).—In an examination over a period of 1 yr. of 120 elementary school children for dental caries

and surface structural defects of the teeth, together with height-weight determinations as an index of nutritional status, "(1) the lower incisors and canines showed the best surface structure and the molars the worst, the upper incisors and canines being intermediate; the structurally soundest teeth are, therefore, those of which the greatest part is formed in utero before dietary deficiencies are normally felt by the child. (2) A definite association existed between the quality of the structure of the teeth and the amount of caries present. The better the structure the greater the resistance to dental disease. (3) An improvement in physical condition as judged by an increase in the nutrition (weight/height) index at ages 5 and 6 was found to be fairly strongly associated with a smaller increase in dental caries."

Studies on the relationship between diastatic activity of saliva and incidence of dental caries, H. J. FLORESTANO, J. E. FABER, and L. H. JAMES. (Univ. Md.). (*Jour. Amer. Dent. Assoc.*, 28 (1941), No. 11, pp. 1799-1803, fig. 1).—Ptyalin was determined by the starch-iodine technic in saliva from 166 subjects classified according to their dental condition into three noncarious groups and five carious groups showing progressive caries development. In general the time required for starch hydrolysis was greater in the noncarious cases, the time for complete diastatic action of the saliva averaging 9.3 min. for the 76 noncarious cases and 4.0 min. for the 90 carious cases. For each group the average diastatic action showed a direct relation to the incidence of caries, the greater diastatic activity being accompanied by a higher incidence of tooth decay. It is suggested that the diastatic activity of saliva be used as an index of caries susceptibility.

Cure of signs of egg white disease by corn oil fatty acids and vitamin B₆, E. M. MACKAY and R. H. BARNES (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 353-357, fig. 1).—Egg white injury in rats resulting from including commercial dried egg white in the ration in considerable amounts developed much more slowly when 10 percent of the fat in the diet was in the form of corn oil than as hydrogenated cottonseed oil. The injection of vitamin B₆ into corn oil-fed rats also brought about the almost complete disappearance of signs and symptoms of egg white injury.

Vitamin-Tabellen der gebräuchlichsten Nahrungsmittel [Vitamin tables of the most common foods], W. DROESE and H. BRAMSEL (*Ernährung, Beiheft 8* (1941), pp. [4]+63).—These tables, set up separately for each vitamin, give average values, expressed in milligrams or gamma per 100 gm., for the content of vitamins A, B₁, B₂ (lactoflavin), P-P factor (nicotinic acid), C (ascorbic acid), and D in foodstuffs most commonly in use in Germany, these being classified as meat; game; fish; milk and cheese; butter and fat; cereals; legumes; root, stem, leafy, and fruit-form vegetables; fruits and fruit juices, etc. The averages are based on selected values from studies (chosen from literature available) considered satisfactory from the standpoint of methodology and statistical accuracy of the data. Supplemental tables indicate the bibliographic references giving the data upon which each figure is based. The bibliography includes 510 references. For the most part figures are given only for fresh and raw material, but where available values are also reported for cooked, canned, dried, frozen, or preserved products. Preceding each table, brief notations are given concerning the nature and chemical properties of the vitamin in question, the clinical picture in case of its deficiency, general nature of the methods of determination, factors employed for converting various units to milligrams or gamma, and a statement concerning the daily requirements.

Vitamin A contents of Shanghai foods.—II, The colorimetric assay of 25 common fishes, P. G. MAR (*Chin. Jour. Physiol.*, 16 (1941), No. 1, pp. 67-72).—

Vitamin A values determined by the method of Moore (E. S. R., 81, p. 451) and expressed as blue units per 100 gm. of fresh flesh are reported for 25 fishes designated by common and scientific names. Data on percentage of edible portion are also reported.

Carotene and human requirements, A. L. BACHARACH (*Chem. and Indus.*, 60 (1941), No. 23, pp. 435-436).—Calling attention to the shortage of preformed vitamin A in England and the increasing necessity for the adult population to rely upon the carotenoids as the chief source of this vitamin, the author emphasizes the unlike effectiveness of different carotenoids as vitamin A precursors and the variation from species to species and from individual to individual in the power of converting the carotenoids into vitamin A, and states that the utmost caution "must be used in calculating the vitamin A contents of human dietaries when the vitamin A is not preformed but is derived from the carotenoids of plant foods." Among the sources of error in such calculations are (1) the calculation of inactive or partially active carotenoids as if they were β -carotene, particularly likely to happen if colorimetric or to a lesser extent spectrophotometric methods are used for estimating the total carotenoids unless chromatographic or other separation has been carried out; (2) possible failure of absorption of carotenoids of different foods, knowledge of this point being incomplete; (3) incomplete absorption through the influence of other factors such as mineral oil; (4) uncertainty as to the effectiveness of conversion of carotenoids into vitamin A, nothing being known about the biochemistry of this process; (5) variations in the effective utilization of carotene with the deficiency of the subject, an inverse relationship being apparent; and (6) possible losses in cooking, although these are generally slight.

"For the reasons enumerated above, carotene is a less effective source of vitamin A activity for the human being, and may be a very much less effective source than the preformed vitamin. In calculating food values from tables of nutrient analyses, including vitamin contents, it is considered advisable to equate not less than 2 μ g. of β -carotene to 1 International Unit of vitamin A. Where an appreciable proportion of the provitamin consists of compounds containing only 1 β -ionine ring, a corresponding further increase must be made in the amount of carotene taken as equivalent to 1 I. U."

Calcium in the alimentary tract of the rat, W. H. ADOLPH and C. C. LIANG (*Jour. Biol. Chem.*, 137 (1941), No. 2, pp. 517-523).—The technic used for studying calcium absorption with rats utilized not fasting animals but those taken from the stock diet and placed for a 4-day period on a diet practically free of calcium but liberal in roughage and adequate in other respects. The rats were then given by stomach tube 2 cc. of calcium lactate containing 10.4 mg. of calcium, after which they were killed at 1-, 2-, and 3-hr. intervals. The alimentary tracts were ligated and removed, and the contents of the stomach, small intestine, cecum, and large intestine were analyzed for calcium. A control group receiving only water was similarly treated. The total amount of calcium found in the alimentary tract of this control group averaged 0.87 mg. per 100 gm. of body weight. This, presumably representing the small amount of calcium contained in the digestive juices plus unabsorbed calcium from the basal diet, was regarded as a blank and was subtracted, in calculation of the amount absorbed by the experimental animals, from the calcium found in the intestinal tract per 100 gm. of body weight. The absorption coefficient, calculated as milligrams of calcium absorbed per hour per 100 gm. of rat body weight, averaged 3.6, 2.2, and 1.5 after absorption periods of 1, 2, and 3 hr.

When the same amount of calcium (as calcium borogluconate solution) was injected intravenously instead of being administered by stomach tube, there was

no significant change in the amount of calcium found in the intestinal tract after the several intervals, even when the body tissues of the animals were saturated with calcium by daily subcutaneous injection of 9.2 mg. of calcium (as borogluconate) during the 4-day period. The subsequent intravenous injection of calcium at 14.3- and 28.6-mg. levels did not produce any significant increase in the amount of calcium in the intestinal contents. These results indicate that in the rat the intestinal tract does not excrete calcium in amounts which are related to the metabolic calcium level.

Severe calcium deficiency in growing rats, I-III. (Univ. Calif. et al.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 61-74, figs. 3; pp. 75-84, figs. 4; 22 (1941), No. 1, pp. 1-6, fig. 1).—Three papers are presented.

I. *Symptoms and pathology*, by M. D. D. Boelter and D. M. Greenberg.—This study is concerned with the symptoms and pathological changes induced in rats kept for long periods on diets low in calcium. These diets, similar to those used by Tufts and Greenberg (*E. S. R.*, 80, p. 275), usually contained but 10 mg. of calcium per 100 gm. of food, although in some cases they contained 4 or 20 mg. The basal diet, containing 546 mg. of calcium per 100 gm., and the control and low-calcium salt mixtures were the same as those used by Kleiber et al. (*E. S. R.*, 85, p. 417).

Rats reared on the low-calcium diets showed retardation of growth, the divergence from the controls becoming pronounced at the end of the second or third week for those animals receiving the diet containing 10 mg. of calcium per 100 gm. The time required for retardation of the growth rate varied with the calcium content of the diet, taking longest with one containing 20 mg. of calcium per 100 gm. of food. Reduced food consumption, due to decreased appetite, and high metabolic rate both contributed to the decreased growth rate of the calcium-deficient rats. These animals, as compared with normal ones, showed reduced sensitivity and reactivity. They had an abnormal posture and gait and showed susceptibility to internal hemorrhage, which resulted in prostration, paralysis of the hindquarters (frequently fatal), encrusted nostrils, bleeding from the anus, and black, diarrheal feces. The hemorrhages and their consequences of prostration and paralysis were easily induced by mild galvanic shock. There was a large increase in the volume of urine and a reduced span of life.

Autopsy revealed osteoporosis or low-calcium rickets. Rats suffering from the effects of calcium deprivation became normal in all respects a few weeks after they were supplied food with an adequate amount of calcium. The injection of calcium salts usually caused the death of the calcium-deprived animals within a few hours. It is pointed out that muscular weakness and collapse rather than tetany result from severe deficiency of calcium in the diet of the rat, and that the outstanding effect of this regimen is the susceptibility of the animal to hemorrhages.

II. *Changes in chemical composition*, by M. D. D. Boelter and D. M. Greenberg.—This report is concerned with the chemical changes in blood, tissues, and bone accompanying the symptoms and pathological changes observed in the calcium-deficient rats. The data reported for the experimental and control groups indicate that "severe calcium deprivation causes a rapid reduction in the serum calcium concentration and a decrease in the calcium and magnesium content of the whole rat carcass. The serum inorganic phosphorus, magnesium, and phosphatase, red corpuscle magnesium, and the blood sugar do not deviate from normal. There is the usual content of hemoglobin in the blood. The soft tissues maintain their normal mineral content. The bones of the deficient animals are greatly demineralized. The percent of ash and calcium of the bone is only about one-

half the normal. There is a lesser decrease in the phosphorus and magnesium percentage. In the bone ash, the contents of calcium, magnesium, and phosphorus are slightly low, high, and normal, respectively."

III. *Serum calcium of individual animals during development of calcium deficiency*, by D. M. Greenberg and W. D. Miller.—Rats taken from the stock diet when they weighed about 100 gm. were placed on the severely calcium-deficient diet used in the above studies, and the change in serum calcium concentration was followed in each animal during the whole course of the deficiency. Calcium, precipitated as the oxalate from a single drop of blood, was determined by using the cerate-Mohr salt titration procedure with *o*-phenanthroline as indicator. The serum calcium concentration began to drop almost at once after the animals were placed on the deficient diet, falling to 7.4 mg. per 100 cc. (average eight animals) after 30 days and to 6.1 mg. after 68 days, with little fall thereafter. The serum protein concentration was not altered by the calcium deprivation. Animals subjected to galvanic shock after 9 weeks on the diet showed paralysis and symptoms of hemorrhage but no change in serum calcium concentration. Great depletion of body calcium and phosphorus stores occurred during the depletion period, analyses of five animals yielding values of 0.426 ± 0.06 percent for calcium and 0.383 ± 0.03 percent for phosphorus as against the normal values of 1.0 and 0.75 percent, respectively.

Ferrous and ferric iron in liver extract, R. S. FISHER and W. A. PEABODY (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 207-209).—Simple aqueous extracts of pork liver were found to prevent the oxidation of added ferrous iron and to reduce added ferric iron. The data presented show that from 50 to 95 percent of the added ferric iron was present in the ferrous state at periods from 1 mo. to $4\frac{1}{2}$ yr. after the addition of the ferric ammonium citrate. It is suggested that "the efficacy of liver and iron combinations in the treatment of the iron-deficiency anemias may be partly due to this action of the liver extract in supplying or maintaining iron in the more easily absorbable ferrous state."

The response to intravenously injected dextrose in rats on normal and B₁ deficient diets, D. J. PACHMAN (*Amer. Jour. Physiol.*, 133 (1941), No. 1, pp. 43-46).—The decrease in tolerance of vitamin B₁-deficient rats to glucose administered orally, as demonstrated by Lepkovsky et al. (*E. S. R.*, 64, p. 294), is shown not to be due to changes in absorption from the intestines as a similar decrease in tolerance to dextrose administered intravenously has been demonstrated. The tail veins were used for the injection. The progressive decrease in tolerance to dextrose as thus administered was apparently independent of food intake. In similar experiments on rats which had been on a normal diet the response to dextrose administered intravenously was fairly constant.

Some effects produced by long-continued subminimal intakes of vitamin B₁, H. R. STREET, H. M. ZIMMERMAN, G. R. COWGILL, H. E. HOFF, and J. C. FOX, JR. (*Yale Jour. Biol. and Med.*, 13 (1941), No. 3, pp. 293-308, pl. 1).—Contradictory findings in the literature on studies of the nervous system of rats, dogs, and chicks on diets lacking in vitamin B₁ are noted, and experiments are reported in which extensive peripheral nerve destruction was found in dogs maintained for from 200 to 393 days in a state of chronic vitamin B₁ deficiency produced by limiting the B₁ intake to about 2 μ g. per kilogram of body weight.

The dogs developed progressively a condition characterized by moderate spasticity of the hind legs, unsteadiness, staggering, and vomiting, while controls restricted to the same food intake but given approximately 8 μ g. of crystalline B₁ per kilogram of body weight daily remained in good health throughout the period. "Histological studies of the nervous system of representative animals revealed extensive myelin degeneration of both peripheral nerves and

posterior columns of the spinal cord in two of the animals with chronic vitamin B₁ deficiency, and less extensive degeneration in another. Sections from the control animals disclosed, at the most, only moderate degeneration of peripheral nerves."

The urinary excretion of thiamin in normal children, R. A. BENSON, C. M. WITZBERGER, and L. B. SLOBODY (*Jour. Ped.*, 18 (1941), No. 5, pp. 617-620).—A group of 22 normal children, 20 girls and 2 boys, from 4 to 10 yr. of age served as subjects in this study of at least a month's duration of the daily intakes and urinary outputs of thiamin. Intakes were calculated from daily food consumption records by the use of the tables of Williams and Spies (*E. S. R.*, 80, p. 710) and 24-hr. excretions determined by essentially the Hennessy and Cerecedo modification (*E. S. R.*, 82, p. 588) of the thiochrome procedure.

The daily vitamin B₁ intakes averaged 990 μ g. (330 International Units), with a ration of 45 μ g. per 100 calories. The outputs ranged from 92 to 602 μ g., with an average of 268 μ g., or 27.2 percent of the amount ingested. It is noted that this average is in good agreement with values reported by Light et al. (*E. S. R.*, 82, p. 425) for rats in excretion equilibrium. The ratio did not hold following the injection of a test dose of 5 mg. of thiamin, which resulted in a wide range in excretion values of from 3.3 to 18.3 percent of the intake. No constant relationship was found between the thiamin content of the first sample voided in the morning and the following 24-hr. excretion, showing that it is impossible to predict a 24-hr. output from the morning sample.

Since the children were normal as far as could be judged by history, physical and laboratory examination, and progressive weight gains during the month of the study and the preceding month, their average intake as noted, 45 μ g., is thought to be adequate to provide for excellent health in children of this age and weight.

The urinary pyruvate in thiamine deficiency, H. A. HARPER and H. J. DEUEL, JR. (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 233-238).—On the theory that an increase in pyruvic acid in the urine would be a more specific indication of thiamin deficiency than an increase in bisulfite-binding substances, as reported by Banerji and Harris (*E. S. R.*, 83, p. 851) and confirmed by Shils et al. (*E. S. R.*, 84, p. 706), rats on a thiamin-free diet were tested at weekly intervals for urinary pyruvate, as determined by the hydrazine procedure of Lu (*E. S. R.*, 82, p. 587), with simultaneous determinations of 24-hr. urinary creatinine as an index of adequate excretion.

As depletion progressed there was a definite increase in pyruvate excretion. Values for 10 male rats increased from a mean of 1.84 ± 0.05 mg. per day on the sixth day of depletion to 3.57 ± 0.34 mg. per day at the forty-third day and for females from 1.50 ± 0.11 mg. per day at 3 days to 2.90 ± 0.21 mg. per day at the forty-fifth day. With lessened food intake the excretion of pyruvate decreased, although the relation was not strictly quantitative. Thiamin feeding, even in small doses, produced a temporary lowering of pyruvate excretion and suspension of the supplement a return to high levels, but supplements adequate for mineral growth did not suffice to lower the pyruvate levels to the original values. A consistent sex difference in pyruvate excretion was noted, the males giving higher urinary pyruvate values than the females studied under identical conditions of thiamin depletion.

Nicotinic acid in blood, B. D. KOCHHAR (*Indian Jour. Med. Res.*, 29 (1941), No. 1, pp. 133-136).—Data obtained by a method similar to that of Swaminathan (*E. S. R.*, 80, p. 131) are reported on the distribution of nicotinic acid in the whole blood, erythrocytes, leucocytes, plasma, and serum of dogs; in the blood of a number of human subjects suffering from various diseases, including lobar

pneumonia, bronchopneumonia, severe anemia, and anemia with diarrhea; and in the blood of a pellagrin with marked anemia.

By far the highest content of nicotinic acid in dogs' blood was in the erythrocyte layer, the values ranging in the four dogs studied from 1,196 to 1,980 μg . percent, and the lowest values in the plasma, from traces to 115, and in the serum from 28 to 120 μg . percent. In the human subjects the values ranged from 252 to 680 μg . percent for the nonpellagrins and from 300 to 412 μg . percent for the pellagrin.

From the similarity in values obtained, it is concluded that the estimation of the nicotinic acid content of blood is probably of little value in the diagnosis of pellagra.

The inhibiting effect of urea on the microbiological assay of riboflavin, H. ISBELL, J. G. WOOLEY, and H. F. FRASER (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 7, pp. 282-285).—Data are presented to show the inhibitory effect of urine on the microbiological assay of riboflavin in urines low in this vitamin. These results confirm the findings of Fraser et al. (*E. S. R.*, 84, p. 564) who, applying the method of Snell and Strong, found that the addition of increasing amounts of such urines to the assay tubes gave progressive diminution of the riboflavin value per cubic centimeter. Further tests, applying this method of assay to solutions of riboflavin containing various individual constituents of urine in physiologic concentrations and above, indicated that urea was the inhibiting substance.

From data on the assay values for riboflavin solutions of various concentrations in the presence of varying amounts of urea, a partial regression equation was established from which the amount of riboflavin actually present could be calculated. Samples of urine, analyzed for urea content and containing known added amounts of riboflavin, were assayed for the vitamin, the values were corrected by the regression equation, and the percentage recovery of added riboflavin was calculated. The tabulated results indicate an average recovery of 103 percent (range 87-118 percent), and suggest that the regression equation may be used to obtain the true amount of riboflavin present in a urine exhibiting the depressing phenomenon.

Riboflavin contents of some typical fruits, C. S. LANFORD, B. FINKELSTEIN, and H. C. SHERMAN (*Jour. Nutr.*, 21 (1941), No. 2, pp. 175-177).—Determination of the riboflavin content of a number of fruits by the feeding method of Bourquin and Sherman (*E. S. R.*, 66, p. 410) gave the following mean values, expressed as micrograms per 100 gm. of the edible portion (described): Apple, 4.3 ± 1.2 ; banana, 47.7 ± 4.6 ; grapefruit, 20.0 ± 2.1 ; grapefruit juice (canned), 11.8 ± 1.4 ; orange, 27.8 ± 2.0 ; pear, 19.8 ± 2.8 ; and tomato, 37.3 ± 3.3 .

Relation of ascorbic acid concentration in juice of Florida grapefruit to variety, rootstock, and position of fruit on the tree, P. L. HARDING and E. E. THOMAS. (*U. S. D. A.*). (*Jour. Agr. Res. [U. S.]*, 64 (1942), No. 1, pp. 57-61).—An earlier study dealt with seasonal changes in the ascorbic acid content of orange juice and the difference in concentration between fruit exposed to the sun and shaded fruit (*E. S. R.*, 83, p. 137). The present study of grapefruit juice is summarized as follows:

The ascorbic acid concentration was determined for 390 individual grapefruits from outside and inside branches of 5 trees each of Marsh grapefruit grown on rough lemon, of Marsh grapefruit grown on sour orange, and of Foster (pink) grapefruit grown on sour orange rootstocks. Fruits from the outside branches from the three sources had a consistently higher ascorbic acid concentration. This difference was found to be significant at the 1-percent level. No significant difference in ascorbic acid content was found between Marsh grapefruit grown

on rough lemon and sour orange rootstocks, although that on rough lemon was slightly higher. A significantly higher ($P=0.01$) ascorbic acid concentration was found in Foster (pink) grapefruit than in Marsh when both were grown on sour orange rootstock. The results showed that Florida grapefruit from various sources has high antiscorbutic properties, and in this experiment the average ascorbic acid concentration was 0.40 mg. per cubic centimeter of grapefruit juice.

Influence of purines, creatinine, and creatine on the oxidation of vitamin C, K. V. GIRI and P. V. KRISHNAMURTHY (*Nature [London]*, 147 (1941), No. 3715, p. 59).—Supplementing the observations previously noted (E. S. R., 85, p. 705), the authors report, with tabulated data, that the oxidation of vitamin C by Cu^{++} at pH 7.2 is completely inhibited by the purines, xanthines, uric acid, and theophylline in a final concentration of 0.00014–0.00017 M, while caffeine and theobromine even at higher concentrations are without effect. Creatine at a final concentration of 0.000095 M had no effect, but creatinine at practically the same concentration, 0.0011 M, afforded almost complete protection. It is suggested that “in addition to glutathione and other thiol compounds which are known to exert similar protective action against the oxidation of vitamin C, the presence of purines and creatinine in the body may insure the existence of reduced vitamin C or prevent the oxidation of the vitamin by Cu^{++} .”

Levels of ascorbic acid in the blood plasma of apparently healthy children, F. E. HOLMES, G. E. CULLEN, and W. E. NELSON (*Jour. Ped.*, 18 (1941), No. 3, pp. 300–309, figs. 5).—Plasma ascorbic acid levels are reported for a group of 69 institutional children over a 10-mo. period, and a second selected group of 49 children from the same institution, about half of whom were rated high and the other half slightly below average in health and physical development. Data were also obtained from children in a convalescent home and others with infectious and metabolic diseases in a hospital ward. Saturation tests were conducted on 17 of the institution children, 13 of whom had been found to have low and the others high plasma levels. Some of the institution children with low levels were given ascorbic acid in addition to their regular diet in amounts of 50 mg. a day for from 17 to 38 days and then 100 mg. daily for 21 additional days.

Estimated dietary intakes of ascorbic acid ranged from 21 to 122, with an average of 60 mg. daily for the institution children, and averaged 120 and 130 mg., respectively, for the children in the convalescent home and the hospital ward. The most significant observation was the relatively large number of children with low plasma levels in all determinations. No factors were found by physical examination or study of the hemoglobin content to distinguish children with low from those with high plasma values. There was no evidence of seasonal variation as a result of changes in dietary intakes. There were no significant differences in the plasma levels of presumably well children in the institution and the sick children in the hospital. In children with both high and low plasma levels, the values were raised by the administration of ascorbic acid, but the excretion of ascorbic acid following the test dose was (with one exception) much less in the children with originally high than low levels. “No conclusion is drawn concerning the minimal adequate level of ascorbic acid in the plasma. However, if this level is to be considered as 0.6 mg. percent, or even 0.4 mg. percent as suggested by Ralli, then it is obvious that dietary standards should be revised. Particularly should this be the case in planning institutional diets, where there is less opportunity for observation of the individual child's intake.”

Vitamin C deficiency in an otherwise normal adult, J. H. CRANDON and C. C. LUND (*New England Jour. Med.*, 222 (1940), No. 18, pp. 748-752, figs. 3).—A normal male subject 27 yr. of age and weighing 158 lb. at the beginning of the experiment subsisted for a period of 4 mo. on a vitamin C-free diet supplemented by the other known vitamins. Plasma ascorbic acid determinations were made daily by the macromethod of Mindlin and Butler (*E. S. R.*, 80, p. 728), and determinations of the ascorbic acid content of the white cells and platelets by the method of Butler and Cushman. Capillary fragility by the Göthlin method, basal metabolism rates, hemoglobin (Sahli), and body weights were determined at frequent intervals. After 85 days on the vitamin C-free diet, an experimental wound was made on the back of the subject and a similar one on a normal control with high blood plasma ascorbic acid, and small portions of the muscle were removed for analysis. On the sixth postoperative day the sutures were removed from both wounds, and on the eleventh day specimens were taken for examination.

During the entire period of the experiment, no sign or symptom of scurvy developed. The plasma ascorbic acid fell rather rapidly during the first 11 days, remaining between 0.14 and 0 mg. per 100 cc. for approximately 28 days and 0 thereafter. The ascorbic acid level of the white cell layer of the centrifuged blood fell from a normal value of 28.0 mg. per 100 cc. on the seventeenth day to 4.0 mg. on the eighty-second day and 0 mg. on the one-hundred and twenty-second day of the diet. The basal metabolic rate fell to —20 percent during a period of losing weight, with somewhat higher values later when the weight losses were checked. A slight fall in red-cell count and hemoglobin about the beginning of the third month was rapidly corrected by an intake of 8 gm. of ferrous sulfate daily. All other tests, including capillary resistance, gave normal values. Subjectively, the only symptom of fatigue was a mild lassitude. No increased fatigue on muscular exertion could be detected in ergograph tests. In spite of the complete absence of vitamin C from the biopsy muscle of the deficient subject, there was no appreciable difference from the control in the healing of the wound.

Experimental human scurvy, J. H. CRANDON, C. C. LUND, and D. B. DILL (*New England Jour. Med.*, 223 (1940), No. 10, pp. 353-369, figs. 12).—The experiment noted above was extended to a total of 6 mo. on the controlled vitamin C-deficient diet, with a subsequent period in which an attempt was made to determine the vitamin C requirement of the subject by saturation tests with ascorbic acid.

After 134 days small perifollicular hyperkeratotic papules began to develop over the buttocks and legs and progressed in severity during the next 3 weeks. After 161 days small hemorrhages or petechiae appeared over the lower legs and gradually extended over the lower thighs. At the end of 182 days a second wound was made similar to the first as noted in the preliminary report. On examination 10 days later the skin showed healing, but beneath the skin there were no signs of healing but instead unorganized blood clots, sections of which on examination showed lack of intercellular substances and capillaries. At this time there were no gross changes in the gums or teeth although X-ray films showed interruption of the lamina dura, no anemia, no diminution in capacity for anaerobic work but inability to perform aerobic work, accompanied by a decrease in rate of disappearance of blood lactate, no change in blood complement titer, and no evidence of lowered resistance to infection. The capillary resistance tests were still negative, there was a fall in blood pressure, a lowering of total phosphorus content of the striated muscle, and an increase in phosphagen phosphorus.

Immediately following biopsy after the second wound, daily doses of 1,000 mg. of ascorbic acid were administered intravenously and plasma and urine ascorbic

acid determinations made hourly. On the first day the plasma ascorbic acid content fell very rapidly during the first 3 hr. following the injection, reaching zero at the end of 5 hr. Saturation of the blood occurred between the third and fourth days, but the tissues were not completely saturated at this time, as shown by the urinary excretion. On the basis of the length of time required before the first signs of scurvy appeared and an estimation of from 4 to 6 gm. as the maximal amount of vitamin C required for resaturation, the maximal daily utilization of the vitamin was calculated to be between 30 and 45 mg.

Experimental human scurvy: Notes on a remarkable study reported by Crandon, Lund, and Dill, F. W. Fox (*Brit. Med. Jour.*, No. 4182 (1941), pp. 311-313).—The findings in the above noted investigations of Crandon et al. are reviewed and discussed in comparison with those of the author and his associates. Attention is called to the complementary nature of the two investigations and the similarity in the results obtained and the general conclusions drawn. "Taken together, the two investigations lend no support to the assumption, so commonly made, that large amounts of the vitamin would improve the general standard of health, though the precarious nature of such meager supplies is equally clearly demonstrated."

Other conclusions drawn from the review are that in the future more attention should be given to follicular keratosis as the first recognizable sign of scorbutic tendency, that estimation of the ascorbic acid content of the white cell platelet layer of the centrifuged blood appears to be a reliable method of investigating subclinical scurvy, that the role of ascorbic acid as a prerequisite for the formation of intercellular substances has now been definitely established for the human subject, and that ascorbic acid may be concerned with the rate of disappearance of the blood lactate accumulating during the performance of physical work.

Vitamin C and fatigue (*Lancet* [London], 1941, I, No. 12, pp. 386-387).—In this editorial comment, based chiefly on the studies of Crandon et al. and Fox et al. noted above, emphasis is given to the correlation in the findings of the former group of fatigue and weakness following performance tests in progressive vitamin C deficiency with an abnormally low rate of disappearance of blood lactic acid produced by the work, and several lines along which further study is needed are suggested as follows:

"First, what is the rate of improvement on restoring ascorbic acid to the diet? Second, is the mechanism of such a nature that when working normally it can be made more efficient by superadded ascorbic acid? Third, is it such that ascorbic acid is used up, and if so can the immediate supply be replenished more rapidly via the alimentary tract than by mobilization from the store which evidently exists in the body?"

Ascorbic acid deficiency and enzyme activity in guinea pig tissues, C. J. HARRER and C. G. KING (*Jour. Biol. Chem.*, 138 (1941), No. 1, pp. 111-121).—The possibility that ascorbic acid in addition to its probable function as a carrier-catalyst in tissue respiration may be of importance as a regulating and protective agent in cellular physiology led to this investigation of the effects of ascorbic acid on the action of two hydrolytic and two respiratory types of enzymes in guinea pig tissues. Liver esterase activity decreased progressively with vitamin depletion to —65 percent in acute scurvy, and the phosphatase activity of intestinal mucosa and kidney cortex was changed to only a moderate degree and of liver and brain to an even lesser extent during scurvy. Succinic dehydrogenase activity of the heart and skeletal muscle showed a marked decrease and cytochrome oxidase activity a moderate decrease in ascorbic acid deficiency.

Studies on hemoglobin regeneration in patients with vitamin C deficiency, E. L. LOZNER (*New England Jour. Med.*, 224 (1941), No. 7, pp. 265-268).—Five patients with moderate anemia and with presumptive vitamin C deficiency, as indicated by total absence of reduced ascorbic acid from the plasma, were treated with bed rest and a diet composed of foods containing no more than a trace of ascorbic acid or of the vitamin B complex. In four of these regeneration of hemoglobin took place spontaneously or with the administration of iron alone. It is concluded, therefore, that hemoglobin regeneration may occur in the absence of reduced ascorbic acid from the blood plasma. It is suggested that loss of blood in scurvy, which is essentially a hemorrhagic disorder, may play a role in the development of the anemia accompanying scurvy.

Vitamin E (*New York: Chem. Pub. Co.*, 1940, pp. VIII+88, figs. 2).—This monograph contains the texts of papers read at a symposium held under the auspices of the food group of the Society of Chemical Industry, April 22, 1939. The papers have been grouped in three parts consisting, respectively, of four papers on the chemical structure and properties of tocopherol (vitamin E), six on the physiological action of vitamin E and the consequences of vitamin E deficiency, and five on the clinical and veterinary uses of wheat-germ oil and vitamin E preparations.

Alpha-tocopherol (vitamin E) (*Rahway, N. J.: Merck & Co.*, 1941, pp. [2]+13).—A supplement to the bibliography noted previously (*E. S. R.*, 85, p. 712).

Uncomplicated vitamin E deficiency in the rabbit and its relation to the toxicity of cod liver oil, C. G. and J. B. MACKENZIE and E. V. MCCOLLUM (*Jour. Nutr.*, 21 (1941), No. 3, pp. 225-234).—In an extension of earlier work (*E. S. R.*, 84, p. 713), evidence was obtained that the ingestion of animal fats (particularly cod-liver oil) is not a prerequisite for the production of nutritional muscular dystrophy in rabbits. Severe lesions of the voluntary muscles were produced on a vitamin E-deficient diet containing only 0.5 percent of animal fat, and were prevented by synthetic α -tocopherol alone. However, the preventive action of the α -tocopherol was rendered ineffective when cod-liver oil was added to the basal diet or when both the α -tocopherol and the cod-liver oil were administered orally within a few minutes of each other. Several possible explanations are given of the dystrophic action of cod-liver oil fed separately from vitamin E. The explanation considered most likely is the destruction of the α -tocopherol by cod-liver oil following the ingestion of the two substances.

Vitamin K—2-methyl-naphthoquinone (vitamin K-active), vitamin K₁, vitamin K₂, other related substances (*Rahway, N. J.: Merck & Co.*, 1941, pp. [2]+20).—A supplement, dated November 1941, to the previously noted bibliography (*E. S. R.*, 86, p. 429).

TEXTILES AND CLOTHING

Wool characteristics in relation to Navajo weaving, J. O. GRANDSTAFF (*U. S. Dept. Agr., Tech. Bul.* 790 (1942), pp. 36, pls. 2, figs. 19).—According to an abstract submitted by the author, the physical characteristics of Navajo wool, in relation to hand weaving of rugs and blankets, were studied at the Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, N. Mex., from 1937 to 1939. Small experimental rugs were woven from selected lots of wool produced by a flock of Navajo sheep. In addition, a study of the physical characters of the wool used in the manufacture of 162 old Navajo blankets and rugs, now in museum and private collections, was made. In the first test it was found that Navajo wool of medium fineness, corresponding in average diameter to

commercial Three-eighths Blood, had the most desirable length and proportion of outer-coat and undercoat fibers for the production of rugs with good texture. In the second test with five lots of wool, representing the range in fiber-diameter dispersion ordinarily encountered in Navajo wool of medium fineness, it was found that the proportion and diameter distribution of outer-coat and kemp fibers were more important factors in determining rug quality than average fineness. This conclusion was verified by a third test with wools coarser and finer than the medium grade. The most uniform wool, containing from 7 to 11 percent of fibers between 40μ and 50μ in diameter, with fewer than 1 percent of fibers exceeding 50μ in diameter, invariably produced rugs with the most desirable texture. The low percentage of grease and crimp associated with the fibers of Navajo wool make it desirable for Navajo handicraft methods. Kemp in excess of 2 percent caused the rugs to be uneven in color and harsh in texture. The old blankets and rugs of superior quality were made from fine or medium Navajo wool containing a low percentage of outer-coat and kemp fibers. Workmanship and wear in these old specimens made the effects of variations in wool quality less apparent than in the new rugs experimentally woven. These tests conclusively demonstrated that wools suitable for Navajo handicraft uses should be from an open type of fleece with a low content of natural yolk, a broad crimp, a staple length between 10 and 20 cm., 5-10 percent of fibers more than 40μ in diameter with maximum uniformity obtainable in wool of this type, and practical freedom from kemp and other medullated fibers.

Women's measurements for garment and pattern construction, R. O'BRIEN and W. C. SHELTON (*U. S. Dept. Agr., Misc. Pub. 454 (1941), pp. VI+73, pls. 14, figs. 13*).—This research project, sponsored and supervised by the Bureau of Home Economics from July 1939 to June 1940, was conducted as a series of State Work Projects Administration projects in Arkansas, California, Illinois, Maryland, New Jersey, North Carolina, and Pennsylvania, with the cooperation of local universities and other educational institutions. In this study, carried out by a plan much like that employed earlier in obtaining body measurements of boys and girls (*E. S. R.*, 86, p. 140), weight and 58 body measurements used in pattern and garment construction were taken on each of 14,698 women. The results obtained were subjected to a detailed statistical analysis so planned as to provide data from which the garment and pattern industry can develop a system of sizes satisfactory to consumers and all branches of the trade. The procedure and scope of the study, the data obtained, and the statistical analysis are presented in detail. As is discussed, the analysis showed that girth measurements have little relation to vertical measurements, and that a combination of horizontal and vertical measurements must be used if all the measurements are to be accurately predicted. Height, the most practical vertical measurement, is as accurate a predictor as any other one, but no one girth measurement is as good a predictor of the other girths as is weight. That is, a stature-weight combination would be the best basis for classifying women's body types for the establishment of a standard system of garment and pattern sizes. Figures for setting up such a system are given. Data for alternative systems which would not be so generally satisfactory are also included.

The importance of clothing in air conditioning, C. P. YAGLOU and A. MESSER (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 15, pp. 1261-1262).—Surface temperatures of clothing, exposed skin, and skin under the clothing were determined in a series of experiments with healthy men and women in clothing of various weights and exposed to ordinary air conditions in an air-conditioned room. The conclusion drawn from the study is that "differences of comfort

standards between men and women, and individual differences, are largely due to differences in dress and can be reconciled by adjustments of clothing, according to susceptibility to cold or heat. If women would dress in winter with clothes that are comparable in warmth to those of men, they would be comfortable in a temperature of 72° F. instead of 76° F., and there would be less discord over the matter of room temperature. Conversely, if men would take off their vests, coats, and collars in hot weather, buildings would not have to be cooled below 83° F. instead of 76° to 80° F. as at present, and difficulties now experienced with sharp temperature contrasts would be alleviated."

Hosiery seam position during the Frazier test, E. C. PETERSEN. (U. S. D. A.). (*Rayon Textile Mo.*, 22 (1941), No. 8, pp. 59-62, figs. 3).—Values for the recovery-stretch ratio (r/s), a measure of how well the stocking returns to its original shape, and the stretch load increase for the inch from 19.2 to 20.2 in. ($s'-s$), a measure of the resistance of the stocking to stretching, were obtained in tests using the Frazier machine (1) with the hosiery seam beneath the lower machine jaw and (2) with the seam between the machine jaws. Twelve hose of each of 11 styles of cotton hose were tested, 6 in each position. An analysis of variance was made for the r/s and $s'-s$ values secured by both methods. The variation within styles of hose was found to be less and the differences between different styles more significant when the hose had been placed in the machine with the seam between the jaws, and it is considered that in future testing of worn hosiery the seam should be so placed. The relative strength of the portion receiving the most wear and therefore the most likely to break is thus tested.

Coat making at home, M. SMITH (U. S. Dept. Agr., *Farmers' Bul.* 1894 (1941), pp. [4]+27, figs. 35).—This publication, designed to help with the simple technics of tailoring, includes pointers on selecting the pattern and materials, lists necessary or desirable equipment, and tells in detail how to go about making the coat. There are also special sections on fur trim and remodeling.

HOME MANAGEMENT AND EQUIPMENT

Improving levels of living of tenant families, D. DICKINS (*Mississippi Sta. Bul.* 365 (1942), pp. 18, figs. 9; also in *Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 1, pp. 4-7, figs. 9).—The levels of living of 100 owner families were compared with those of 117 share-renter and 93 sharecropper families. All were young white families residing in poorer agricultural areas of the State and averaging 4.6, 4.8, and 4.4 family members, and \$790, \$577, and \$484, respectively, in yearly incomes. Returns from farming, value of housing and of products furnished by the farm, and money income from nonfarm sources were greater for owner than for tenant families. Returns from farming and value of housing and of products furnished by the farm were greater for share-renter than for sharecropper families, but the latter group had the greater money income from nonfarm sources because of work relief received. Money incomes of share-renter and sharecropper families were about the same (one group earned more from the farm and the other off the farm), but the nonmoney income of the latter group was the lower by about \$100, since they lived in poorer houses, produced less food, and had less frequent increases in inventories. Cash expenditures for family living were about \$100 greater by owner than by tenant families. The two groups of tenant families had about the same cash expenditures, but the share renters spent less for food, since they raised more at home, and so had more to spend for clothing, recreation, and community welfare. Net deficits,

due chiefly to increase in debts for family living, were shown by 34 percent of the owner families, 45 percent of the share renters, and 52 percent of the sharecropper families.

From these findings it is considered that improvement in levels of living of tenant families in such areas would involve (1) more attention to the use to which each acre is put, with receipts from the sale of farm products distributed throughout the year; (2) greater production of food for family consumption; (3) making of simple repairs on buildings and premises; (4) training in nonagricultural pursuits to make possible earnings from nonfarm activities; (5) better understanding of qualities in goods and their use; and (6) a feeling of need for improved standards of living.

How do farmers adjust to low incomes? (*Wisconsin Sta. Bul. 453 (1941), pp. 32-33*).—This brief report is based on findings by M. Cowles and I. Head of a recent survey of expenditures of farm families operating farms in several counties in the State.

MISCELLANEOUS

Report of the Secretary of Agriculture, 1941, C. R. WICKARD (*U. S. Dept. Agr., Sec. Agr. Rpt., 1941, pp. VI+245*).—In addition to a summary of findings of the State agricultural experiment stations, the principal findings of the Department are presented. The latter data are noted elsewhere in this issue.

Report of the Director of the Office of Foreign Agricultural Relations, 1941, L. A. WHEELER (*U. S. Dept. Agr., Off. Foreign Agr. Relat. Rpt., 1941, pp. 14*).—This report for the fiscal year ended June 30, 1941, describes and discusses the effects of the Lend-Lease Act, the war and agricultural world trade, post-war plans for world agriculture, new services performed by the Office, and its organization and functions.

Fifty-third Annual Report [of Georgia Station, 1941], H. P. STUCKEY (*Georgia Sta. Rpt. 1941, pp. 161, figs. 31*).⁵

Forty-eighth Annual Report [of Minnesota Station], C. H. BAILEY (*Minnesota Sta. Rpt. 1941, pp. 95*).⁵

What's new in farm science: Annual report of the director, [Wisconsin Station, 1941], I, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 453 (1941), pp. [2]+88, figs. 25*).—This portion of the annual report of the station deals with animal diseases and breeding; animal nutrition; home economics; farm income and welfare; farm engineering; game management; bacteria, molds, and yeasts; and dairy products.⁶

Methods of correlation analysis, M. EZEKIEL (*New York: John Wiley & Sons; London: Chapman & Hall, 1941, 2. ed., pp. XIX+531, figs. [91]*).—A revision of the book previously noted (*E. S. R.*, 64, p. 399), with the introduction of a chapter on the method of analysis by variance.

⁵The experimental work reported is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—A grant of \$150,000 from the General Education Board for the conduct of a five-State regional study of land tenure and farm labor problems has been announced. The university has been designated as fiscal agent. The research will include field studies of land tenure and farm labor problems in Arkansas, Mississippi, Louisiana, Texas, and Oklahoma. A regional staff, headed by Dr. H. C. Hoffsommer, professor of rural sociology and sociologist at the Louisiana University and Station, will be employed, and a regional research laboratory will be set up at the university on a 3-year basis. The project will be under the direction of the southwestern land tenure research committee, of which Dr. C. O. Brannen, head of the department of rural economics and sociology and assistant director of research, is chairman.

Colorado College and Station.—The Colorado Agricultural Research Foundation has been set up at the college as a nonprofit corporation to promote agricultural research. The plan is similar to that of the Wisconsin Alumni Research Foundation. It is expected that the major part of its funds will come from patentable discoveries and inventions of the staff of the college and station, but provision is made for contributions from public-spirited citizens.

Georgia Station.—Wallace Kincaid Bailey, horticulturist of the Puerto Rico Federal Station, has been transferred to this station to carry on cooperative peanut studies.

Iowa College and Station.—Dr. Frank F. Riecken, associate in soil survey of the Illinois Station, has been appointed research assistant professor of soils. Dr. S. W. Edgecombe, extension associate professor of horticulture, has been appointed associate professor of plant science in the University of Manitoba.

Kentucky University and Station.—The resignations are noted of Dr. B. J. Errington as animal pathologist and E. J. Beers as field agent in cream grading. Military leave has been granted to J. D. Foster, inspector in charge of the creamery license section; Dr. Ladd N. Loomis, assistant veterinarian; T. C. Hardesty, field agent in cream grading; R. H. Hageman, assistant chemist; H. F. Miller, assistant in agronomy; and W. C. Templeton, Jr., instructor in farm crops. R. O. Gustafson has been appointed assistant forester.

Minnesota University and Station.—G. Leroy Peterson, instructor and assistant in agricultural economics, has been appointed assistant professor of agricultural economics in the University of Connecticut.

Cornell University and Station.—Dr. Karl McKay Wiegand, professor emeritus of botany, died March 12 in his sixty-ninth year. A native of New York, he was graduated from the university in 1894 and received the Ph. D. degree in 1898. He was assistant and instructor in botany from 1894 to 1907 and associate professor of botany at Wellesley College from 1907 to 1913. Returning to the College of Agriculture in the latter year as head of the department of botany, he served in this capacity until his retirement in August 1941. He was the author of about 100 papers on the taxonomy of plants and plant geography.

Nevada Station.—Preliminary work has begun on a study of methods of extracting rubber from rabbit brush (*Chrysothamnus nauseosus*), a common western desert shrub which contains a high content of rubber.

New York State Station.—William G. Walter, assistant in bacteriology, has been appointed assistant professor in bacteriology in the Montana College.

North Carolina Station.—A central crops research farm to be located 10 miles south of Raleigh and known as the McCullers Branch Station was authorized by the last legislature for field work in agronomy, horticulture, botany, and entomology. Two research greenhouses were also provided, one for agronomy and one for horticulture.

Dr. W. J. Peterson has been appointed head of the new division of nutrition, physiology, and genetics in the department of animal industry, effective May 1. Dr. E. R. Collins has been placed in charge of extension and coordinator of research and extension programs in agronomy, effective on the same date. Other appointments include L. G. McLean as project leader in nursery and flower research, N. C. Teeter as assistant in agricultural engineering, and R. W. McMillen as assistant in agronomy for small grain breeding work vice W. H. Chapman.

Oklahoma Station.—The station has inaugurated a new publication series to be called the V Series and consisting of 4- and 8-page leaflets dealing with food production problems. Elmer L. Hartman, in charge of floricultural work, has entered military service and his duties have been taken over by W. R. Kays.

Tennessee Station.—The General Education Board has granted funds for a research project on the economic basis of farm forestry. This will be carried through a period of 3 years or more and will involve the cooperation of all departments of the university which are related to this field.

Texas Station.—A tract of 160 acres formerly operated by El Paso County has been acquired for operation as the El Paso Valley Experiment Station. Dr. S. E. Jones has been appointed superintendent. A State fund of about \$5,000 has been granted for an office building, barn, and hay shed. The adaptability of various field, vegetable, and drug crops to the region will be tested.

Wyoming Station.—A new project on alfalfa pollinization by honeybees in Wyoming has been authorized and will be carried on by the associate research apiculturist with some student assistance. The purpose of this work is to determine the role of the honeybee in tripping the alfalfa flower and its value as an agent in cross-pollinization. It is also hoped to compare the relative efficiency of the Italian and Caucasian races of honeybees in pollinizing the alfalfa flower.

Another new project is on varieties of Wyoming green vegetables desirable for freezing and manipulative treatment to conserve the maximum amount of ascorbic acid. The agronomy department will grow the vegetables, and the testing will be done by the home economics research assistant.

Robert F. Eslick, assistant agronomist, has resigned to accept a similar position with the Colorado College. Ward Smith has been appointed animal husbandman.



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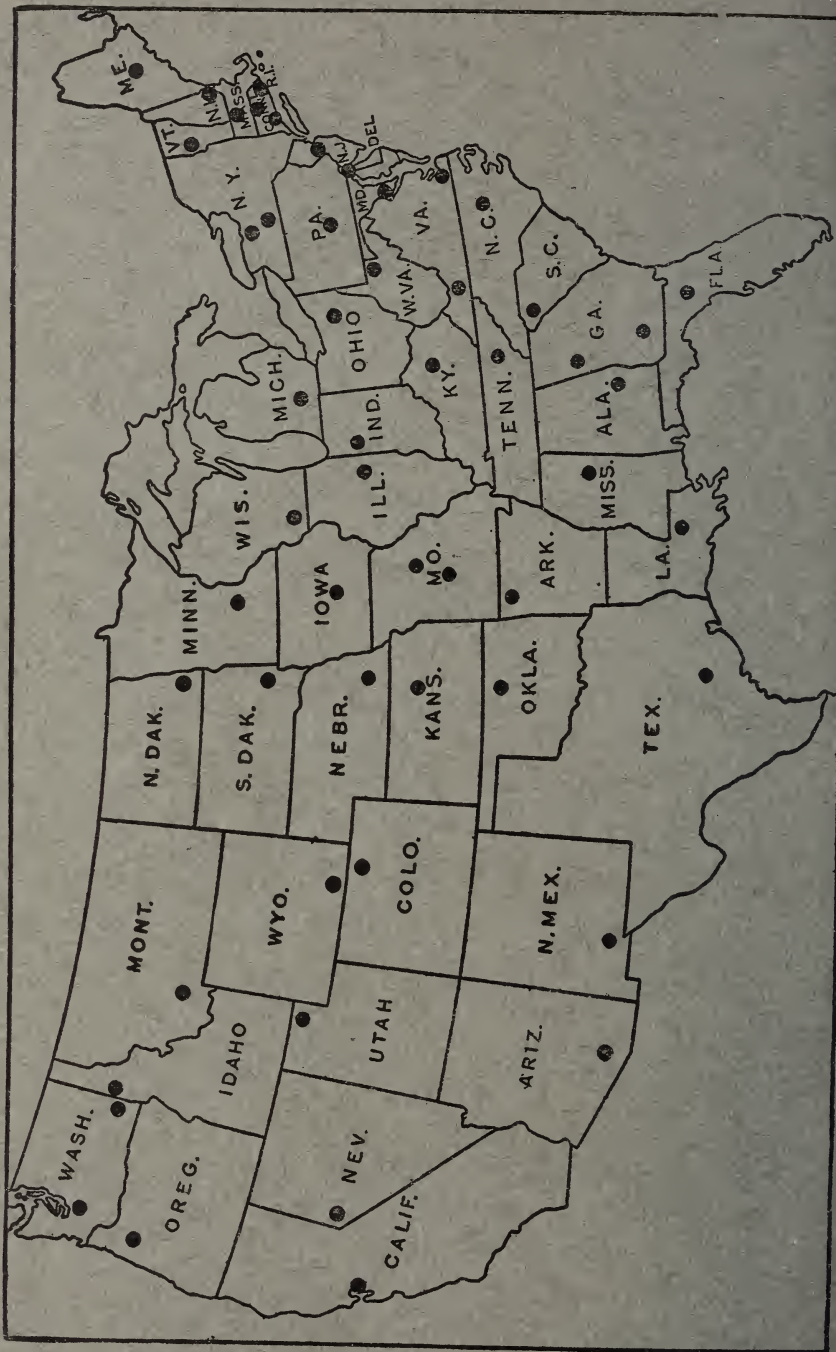
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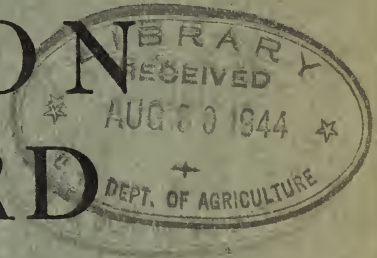
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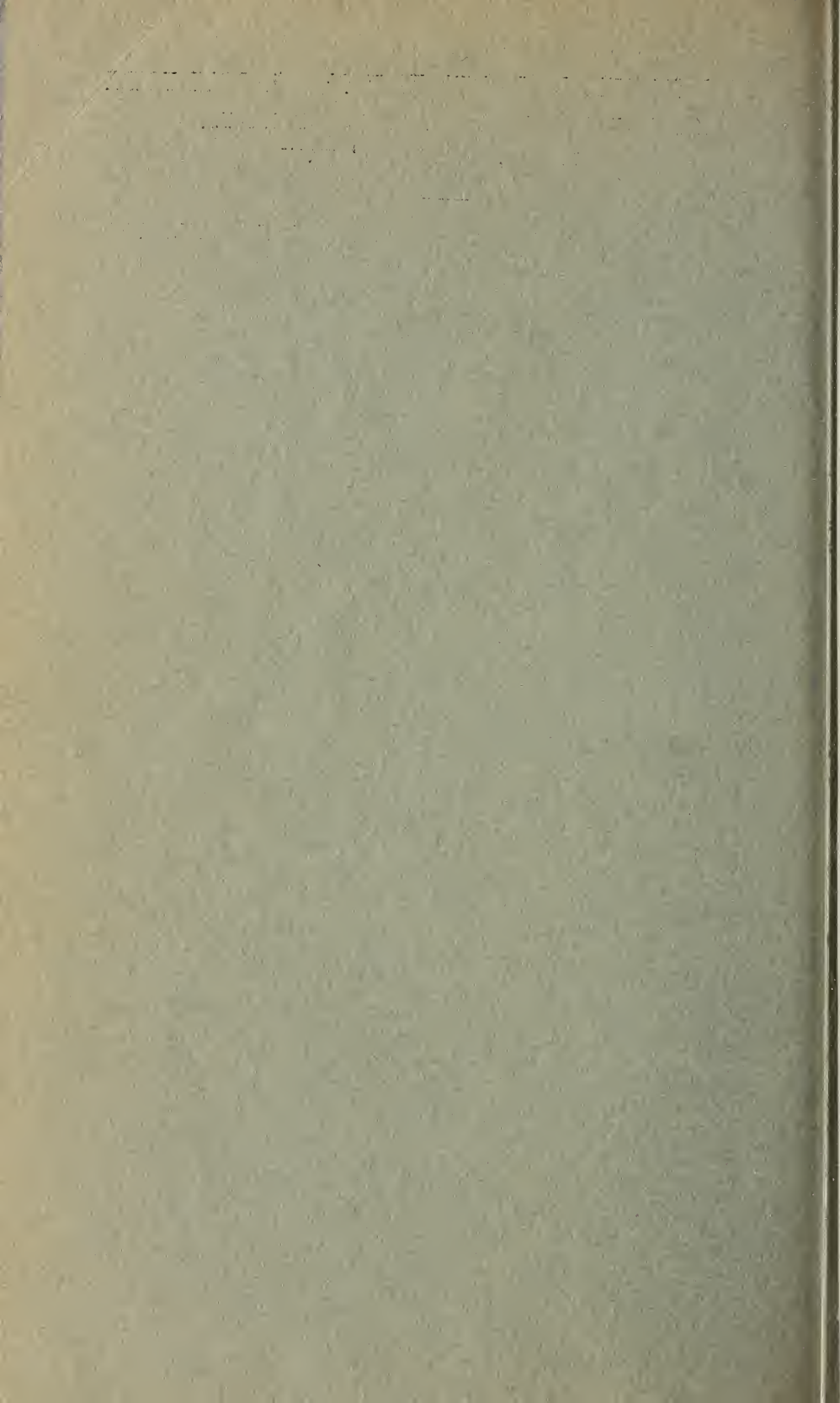
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